THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

COMPUTERWORLD

$2.00 A COPY; $44/YEAR
MAY 6. 1985
VOL. XIX, NO. 18

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In Depth
New partners in information
ID/1

In Depth
Part 2:
Primer for friends and lovers/**ID/7**

Technology yields banks slim return on investment

By Charles Babcock
CW New York Bureau

NEW YORK — Banking institutions invested heavily in high technology at the end of the 1970s, but no bank or group of banks emerged with a competitive advantage as a result.

That is the conclusion reached by the Big Eight accounting firm of Touche Ross & Co. in a recent survey of executives at 200 banks worldwide.

Spokesmen for the New York management consulting firm declined to speculate on what would have happened if a bank had not invested in technology during that period. Instead, they said technology costs to banks were higher than anticipated without yielding any long-term competitive advantage.

Even Citibank N.A. here, recognized as having gained a consumer market share through its early use of automated teller machines, has found costs rising in step with new revenue.

"There is no bank that has grown significantly and kept costs down," said Jack Shaw, a Touche Ross senior consultant.

The survey reported disappointment on the part of many senior executives at major banks, including 50 in the U.S., that computerization had not yielded more bottom-line benefits.

The Touche Ross researchers said, however, that banks' spending on technology will not slacken. Rather it will "increase sharply between now and 1990" because of the competitive pressures of international banking, they reported.

At the same time, senior bank executives will try to improve the investment's contribution to bank profits by linking new technology more closely to marketing plans, Shaw said.

In the case of automated teller ma-

See **BANKS** page 8

Bypass cost, payback have users wary

Last in a series on corporate bypass strategies.

By John Dix
CW Staff

Although some companies already benefit from communications bypass technologies, many users are not sold on the idea because of high up-front costs and fear of being locked in by the systems.

Users interviewed said they are continually surveying bypass technology with an eye toward fluctuating common-carrier rates and service options. Some said, however, that their geographically dispersed networks made bypassing standard telephone facilities impractical.

While cost is the factor most commonly used to justify bypass systems, it is not the only consideration users cited. The lead time associated with common-carrier circuit installation is a key motivation for bypass, according to Roland W. Sprouse, director of communications planning and engineering for American Airlines. "There are probably some savings to be gained by doing it, but the problem is getting service in a timely fashion and gaining control of escalating expenses."

American Airlines is stepping carefully, given the economics of the situation. "We're skeptical about going out and doing anything major right now because rates and tariff filings are being batted around, and things are so unstable," Sprouse said.

This flux, coupled with high up-front equipment costs, often makes it hard to cost-justify bypass systems within a permissible payback period.

"If a bypass system has a straight five-year payback, the investment would be questionable with all the dynamics in the industry right

See **BYPASS** page 8

TOP OF THE NEWS

Lisa, we hardly knew ye. Apple Computer will cease production of its once-vaunted microcomputer. **Page 2.**

■

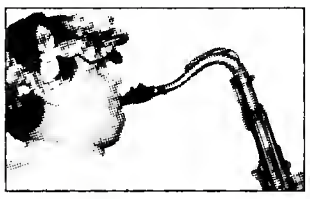
From tape to cartridge in three months. An early user of IBM's 3480 tape drive converted about 70,000 3420 reel-to-reel files to the 3480 cassette format in three months. **Page 3.**

■

Xerox and Compaq rolled out the micros, the former unveiling a series of five IBM-compatible machines and the latter a line of portable IBM Personal Computer AT compatibles. **Page 12-13.**

Applied Data Research offered IBM IMS and DL/1 users another pathway to relational data base management system technology by introducing automated migration software. **Page 14.**

■



A flair for the offbeat. Phillipe Kahn, founder of Borland International, has gone from a garage office to the big time in two years. **Page 51.**

■

FYI

Out of work at 46, manager sets DP skills on new course

By Charles Babcock
CW New York Bureau

After 25 years in MIS, David H. Dorbandt had come to see computer managers as agents of change. They continually needed foresight and adaptability to help others adjust to technology within their companies.

Now Dorbandt, 46, finds he needs all of his resourcefulness to cope with a change that has affected him more than many of his coworkers. It required him to cease representing his company and begin representing himself, a middle-aged man looking for a job.

On Feb. 4, Hoffmann-LaRoche, Inc., the Nutley, N.J., pharmaceutical company where Dorbandt worked for 18 years, announced it was cutting its staff by 1,000 employees because its patent on the drug Valium was due to expire and major revenue cuts were expected. Particularly hard hit was the systems development side of MIS, former employees of the department claimed. Dorbandt was a

See **DORBANDT** page 6

A look at tomorrow today

In this issue, *Computerworld* introduces Update, a monthly special section focusing on a series of management and technical issues of current and future interest to you, the reader.

Update aims to look at the near-term implications of future technologies as well as the critical management issues facing DP departments today.

The inaugural section of Update, titled "Toward the fifth generation," follows page 50 and provides a comprehensive look at the next generation of technology. AI, expert systems, supercomputers, parallel processing and the race between the U.S. and Japan for the lead in these technologies are among the areas covered.

In June, Update will focus on recruiting and keeping a DP staff.

NEWSPAPER

Random access

Industry sources said the strong U.S. dollar in international currency markets is resulting in a tremendous flow of European-manufactured IBM mainframes into the U.S. third-party market. Leasing firms are buying new and used mainframes in relatively inexpensive European currencies and shipping them to the U.S. One independent observer said IBM is winking at that practice but may come down hard on a European firm caught buying discounted new equipment from West German educational institutions and shipping it here for resale.

■

Tandem Computers, Inc. is already developing a successor to its recently introduced Nonstop EXT, according to sources close to the company. Like EXT, the follow-up machine will preserve Tandem's existing architecture and will be aimed at users in the branch or district offices of large corporations. But Checkmate, as the unannounced CPU is known internally, will be implemented in gate arrays — a technology not now present in Tandem processors.

■

Gate arrays will also form the technological base for a second processor model now under development within Tandem Computers, Inc., according to an analyst who follows the vendor closely. Continuing with its chess theme, Tandem has reportedly nicknamed the second processor Check and intends for the system to be a replacement for its current top-of-the-line mainframe, the Nonstop TXP. Check is said to be slated for introduction early next year.

■

Plea-bargaining talks have begun in the computer crime case of Philip Gonzalez Fadriquela, a computer operator charged with illegally accessing U.S. Department of Agriculture computers in Colorado, according to a source. In February, a federal grand jury in Denver issued an indictment containing three felony charges and four misdemeanor charges [CW, Feb. 11]. A trial is scheduled to begin May 13 if the plea bargain falls through, the source said.

■

OEMs in the U.S. and Europe have gotten a good look at DEC's Microvax II, which could be unveiled next week. According to France's Matra Datavision, the product line will consist of five models, based on Cmos technology, with memory that can be upgraded from 512K bytes to 12M bytes. The upward limit of the Microvax I is 1.5M bytes. Low-end models in the line are expected to be available in June.

■

Management Science America, Inc. (MSA) is expected this month to announce a series of distributed personal computer applications, according to a company source. The micro applications will reportedly allow reference data bases to be downloaded via MSA's Expert Link to IBM Personal Computers for processing, including transaction validations and edits. The products will help relieve the host and lower communications costs because communication with the host is not required while the micro is processing. Prices will reportedly range from $1,000 to $4,000 per application, with site licensing available for companies with 100 micros or more.

■

Hewlett-Packard Co.'s much-ballyhooed Spectrum product family will make its long-awaited debut before year's end, according to Douglas Chance, vice-president and general manager of HP's Information Systems Group. Chance claimed that, contrary to recent reports, development work on the successor to the HP 3000 line is proceeding according to schedule. Chance said that about 40 Spectrum systems are up and running in various test sites.

Apple to drop faltering Lisa

By Kathleen Sullivan
CW West Coast Bureau

CUPERTINO, Calif. — Apple Computer, Inc. last week said it will halt production this summer of the Lisa personal computer, a system that gained recognition for its user interface design but floundered in the marketplace.

In the same announcement, Apple said it will introduce an external 20M-byte hard disk drive for its 512K-byte Macintosh computer this fall.

Subsequently, the company told securities analysts that it is considering further cost-cutting measures in light of slow demand for personal computer products. Commenting on Apple's recent performance, Chairman Steven Jobs last week said, "April has not been one of our better months."

Lisa users who were contacted were not dismayed about Apple's announcement. Joel Eide, microcomputer specialist with Winnebago Industries, Inc. said that for reasons he would not detail, the Forest City, Iowa, recreational vehicle maker was already planning to emphasize the use of IBM Personal Computers and compatibles, rather than the 21 Lisas it already has installed.

Asked if he would buy more Lisas at closeout sale prices, Eide said, "We have saturated our need for more Lisas."

In response to Apple's announcement, a user in the corporate data processing department of a major Los Angeles manufacturer said, "Apple took [its] time in terms of converting [the Lisa] to a [Macintosh], and frankly, I don't know what . . . we're going to do with it."

Introduced two years ago, the Lisa represented Apple's first venture into the corporate personal computer market.

Although the microcomputer was applauded for its use of icons, graphics and a mouse pointing device, analysts warned that its $10,000 price tag was too high.

Since its introduction, the Lisa's price has plummeted. The most recent price cut was announced at Apple's annual meeting in January, when the company launched its Macintosh Office. At that time, Apple renamed the Lisa, dubbing it the Macintosh XL, and cut its price to $3,995.

Only four months ago, Apple was describing the Macintosh XL — with its 1M byte of internal storage and 10M-byte internal hard disk drive — as the high-end system in its Macintosh Office. But its tenure in that office was short-lived.

Barbara Krause, a company spokeswoman, said Apple will continue to service and support the machine. This spring, Apple will begin shipping a number of products designed to enhance the system, including a kit to change the Lisa's screen resolution so that it corresponds to a Macintosh screen and software that will allow users to convert Lisa data files to Macintosh files, she said.

Tim Bajarin, an analyst with Creative Strategies International, a San Jose, Calif.-based market research firm, applauded the company's move. He said Apple's decision to suspend production of the Lisa would allow the firm to fine-tune its concept of the Macintosh Office.

Chris Steitz, an analyst with Infocorp, a Cupertino, Calif.-based market research firm, estimated that Apple had sold only 60,000 Lisa personal computers in two years. Although the machines began moving faster in recent months, it was probably a case of "too little, too late," Steitz said.

Analysts noted that the departure of the Lisa would leave a void at the high end of the Macintosh line, even with the introduction of the 20M-byte hard disk drive. They said Apple would fill that gap with future Macintosh announcements.

Krause said she did not know whether the decision would result in layoffs at Apple's Dallas plant, where workers assemble the Lisa, as well as the Apple IIc and Apple IIe. She said the company would try to absorb the workers affected by the announcement into its other operations.

CW senior writer Ed Warner contributed to this article.

NEWS SUMMARY

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DEC unveiled an enhanced PDP-11/84 machine said to perform 20% to 40% better than the original OEM version/**4**

Two major large-systems software vendors unveiled products during a busy week of microcomputer-to-host link announcements/**4**

Unemployed Hoffmann-LaRoche MIS workers are looking to enter the world of IBM/**6**

Some placement professionals are pessimistic about finding jobs for out-of-work Honeywell users/**6**

Xerox rolled out a fleet of products last week, including personal computers and laser printers/**12**

Compaq launched IBM Personal Computer AT-compatible products and cut prices on all existing models except the single floppy disk drive Portable Personal Computer and Deskpro Model 1/**13**

ADR offered IBM IMS and DL/1 users another path to relational DBMS technology with the introduction of automated migration software/**14**

The FCC allowed AT&T's restructuring of private-line rates to go into effect, subject to further investigation and monitoring/**15**

Comdex/Spring '85 opens its doors in Atlanta, expecting to draw 50,000 attendees/**16**

James Martin, information systems guru, sees a future of improved software productivity following a change in DP methodology/**17**

A Xerox executive recently challenged the belief that large doses of computing resources and technology spending result in high levels of management productivity/**18**

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A Bank of Boston vice-president said a company's computer resources must be tied to its business planning/**24**

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IBM 3480 user converts 70,000 tape files to cartridge

By Tom Henkel
CW Staff

BARTLESVILLE, Okla. — One of the first users of IBM's 3480 tape drive, Phillips Petroleum Co. here, said it was so impressed with the unit that it decided to convert nearly all of its 10½-in., reel-to-reel 3420-type tape files to operate on the cartridge-based 3480.

It took Phillips roughly eight months from the time the first 3480 was delivered on IBM's early delivery program to convert approximately 90% of its 80,000 active tape reels to the 3480 format. Those eight months included testing and debugging the 3480. The actual conversion process took about three months, according to Russel Shelton, the company's manager of DP operations, in a recent interview.

The 10% of Phillips' active 3420-type reels that were not converted to the 3480 format contain data that is regularly sent to outside organizations, such as data for conversion to microfilm. That data will remain in the 10½-in., reel-to-reel format, as will approximately 40,000 additional reels of inactive data, Shelton said.

'Converted all that can be converted'

"We have converted all that can be converted to cartridge tape," Shelton said, noting that two data centers within the facility here expanded their storage capacity, switching from 57 3420 Model 6 tape drives connected by eight control units to a combination of 58 3480s (also connected via eight control units) and 15 3420 drives connected with four controllers. The drives work in conjunction with Phillips' configuration of IBM mainframes, which include two 3084 processors, two 3081 Model K processors and a 3081 Model D. The company uses IBM's MVS/XA operating system with JES3.

Phillips' sweeping conversion to the 3480 runs counter to the expectations of most industry analysts, who believe that users will probably phase in the 3480 over a period of years starting with one application and gradually expanding. In fact, Shelton noted that "when we came up with [the total conversion] approach, it was new to [IBM]."

Admitting that the Phillips conversion may be a unique case, Shelton said the company decided to convert to the 3480s because the drives proved to be more reliable than the older 3420s. For example, after installing the 3480s, Phillips has virtually eliminated the need to rerun tapes because of hardware errors. Furthermore, Shelton maintained, the 3480 operates with roughly 20% more throughput than the 3420, and head cleanings have been cut from six times a day on the 3420 to once a week on the 3480.

"We're a conservative shop and usually don't go into things so early. We had reservations; you don't change the bulk of the corporate data without thinking about it," Shelton said, adding that the 3480 conversion was further complicated by a simultaneous operating system migration from MVS/SP to MVS/XA.

Double conversion not ideal

The double conversion was not an ideal situation, nor was it planned. The company originally scheduled the MVS/XA conversion prior to installing the 3480s, in hopes of avoiding confusion or inconvenience to users. But the MVS/XA conversion was delayed, Shelton said.

"Once you jump off a cliff, it's hard to climb back up," Shelton said, adding that Phillips decided to convert to Extended Architecture and the IBM 3480s at the same time to avoid prolonging the conversion process.

The eight-month conversion to the 3480s was handled in two stages. Phillips first converted 10½-in. reel tapes that were being used by a 3084 processor in an applications development environment. By doing this, Shelton said, Phillips hoped to avoid losing active production data if there were problems with the 3480s.

"If it had been a bomb, we could have changed our minds" at the end of the first 3480 installation phase, Shelton said. "But the 3480s have just been excellent," he said.

Focus on DBMS

The June *Computerworld* Special Report will focus on data base management systems and the evolution of that market. It will also discuss buying and maintaining corporate data bases.

Contributions are welcome and should take one of two forms: a tutorial article, discussing an issue or trend, or an application story, outlining a user firm's experience.

Articles must be typed, double-spaced and range in length from four to six pages. Artwork is welcome. Authors should include a biography and a telephone number.

The deadline for submissions to the Special Report is May 8.

If you have a story to tell, send it to Janet Fiderio, Special Reports Editor, *Computerworld*, Box 880, 375 Cochituate Road, Framingham, Mass. 01701.

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DEC PDP-11/84 upgrade boasts 40% performance hike

MAYNARD, Mass. — Digital Equipment Corp. recently announced an enhanced version of its PDP-11/84, said to perform from 20% to 40% better than the original OEM version announced Dec. 4.

Available to both end users and OEMs, the system is being offered as a boxed, rack-mountable CPU or as a system kernel configuration capable of supporting rack-mountable disk and tape units, the vendor said.

Said to be the highest performance model of the 16-bit PDP-11 line, the PDP-11/84 was designed for science and engineering as well as commercial, educational and medical applications. The unit is software compatible with other PDP-11 series processors and is supported by all PDP-11 operating systems. In addition, the PDP-11/84 is hardware compatible with DEC's line of PDP-11 Unibus-based systems.

The PDP-11/84 includes an 18-MHz implementation of DEC's J-11 CPU chip set. Also included is a floating-point accelerator chip and memory modules that incorporate 256K-bit memory chips.

Cache memory is composed of 8K bytes of direct-mapped storage and 32K bytes of read-only memory for bootstrap and diagnostic operations. The 256K-bit random-access memory features private-memory interconnect that reportedly accelerates memory (specifically direct-memory) access transfers. Main memory can be expanded in 1M- or 2M-byte increments up to 4M bytes. A battery backup option is also available, the vendor said.

The rack-mountable version of the PDP-11/84 is housed in a 10½- by 19- by 27-in. enclosure. A 1M-byte configuration costs $18,000.

The system kernel configuration is mounted in a 42-in.-high standing cabinet that includes the same functional elements of the rack-mountable version but also offers additional backplane mounting space and an additional power supply for expansion.

The cabinet also has mounting space for a 10½-in. rack-mountable option such as a disk subsystem. A 1M-byte system kernel configuration costs $22,500.

DEC also announced two kits to upgrade previous OEM versions of the PDP-11/84 to the higher performance model. The kits consist of a CPU board and 1M or 2M bytes of memory. The 1M-byte kit costs $4,500. Shipments of all the products are slated to begin this month.

Further information is available from DEC, which is located at 111 Powdermill Road, Maynard, Mass. 01754.

Informatics, RTI launch software for micro-to-host links

IBM-DEC, Infocom connections debut

By John Gallant
CW Staff

The microcomputer-to-host link arena has become more crowded as two large systems software vendors unveiled link products recently.

Relational Technology, Inc. (RTI) entered the link fray for the first time with the unveiling of an IBM Personal Computer link to its Ingres relational data base management system running on Digital Equipment Corp. VAX processors and other machines.

Informatics General Corp., in a joint announcement with Infocom, Inc., introduced its fourth micro-mainframe link — a product that ties Informatics' Answer/DB mainframe data extraction software to Infocom's micro-based Cornerstone relational DBMS.

According to an RTI spokesman, Ingres/PC Link combines the Ingres Visual Query Language, Ascii terminal emulation and file transfer capabilities. It automatically reformats data from Ingres for processing by micro software products, including Lotus Development Corp.'s 1-2-3, Ashton-Tate's Dbase, Microsoft Corp.'s Multiplan and Micropro International Corp.'s Wordstar.

The IBM Personal Computer component of Ingres/PC Link runs under IBM's PC-DOS and requires 128K-byte memory and a single 5¼-in. drive. The micro and host components can be connected by dial-up/direct asynchronous communications or through an Ethernet local net.

The price for Ingres/PC Link for a single host system, including the right to make an unlimited number of micro components, ranges from $1,500 to $12,500, depending on host processor. The spokesman said general shipments of Ingres/PC Link are scheduled to begin within three months.

RTI is located at 1080 Marina Village Pkwy., Alameda, Calif. 94501.

Informatics and Infocom jointly announced Micro/Answer for Cornerstone, which a spokesman said provides a communications link between Cornerstone on the Personal Computer and most IBM mainframe files and DBMS. The product allows a user to extract selectively information through Answer/DB from IBM's IMS/DL/1, Vsam, Cullinet Software, Inc.'s IDMS, Cincom Systems, Inc.'s Total, Software AG Systems, Inc.'s Adabas and other DBMS and file access methods. The selected data is automatically reformatted by the link in the format required by Cornerstone.

The minimum hardware requirement for Micro/Answer for Cornerstone is a Personal Computer with 256K-byte random-access memory (RAM) and two 360K-byte disk drives. Micro/Answer for Cornerstone will be available in July at $550 per copy. Cornerstone is priced at $495, and Answer/DB is priced at $30,000 for IBM's DOS operating system and $45,000 for IBM's OS.

In addition to the link announcement, Informatics introduced a microcomputer-based package that allows microcomputer software developers to add micro-mainframe link capabilities to their products. The Micro/Answer Toolkit, the spokesman said, features software utilities, documentation and technical assistance to enable a developer to customize Informatics' Micro/Answer link technology for the microcomputer software. The Toolkit will be available only through special marketing and license agreements with Informatics.

Informatics is located at 21050 Vanowen St., Canoga Park, Calif. 91304.

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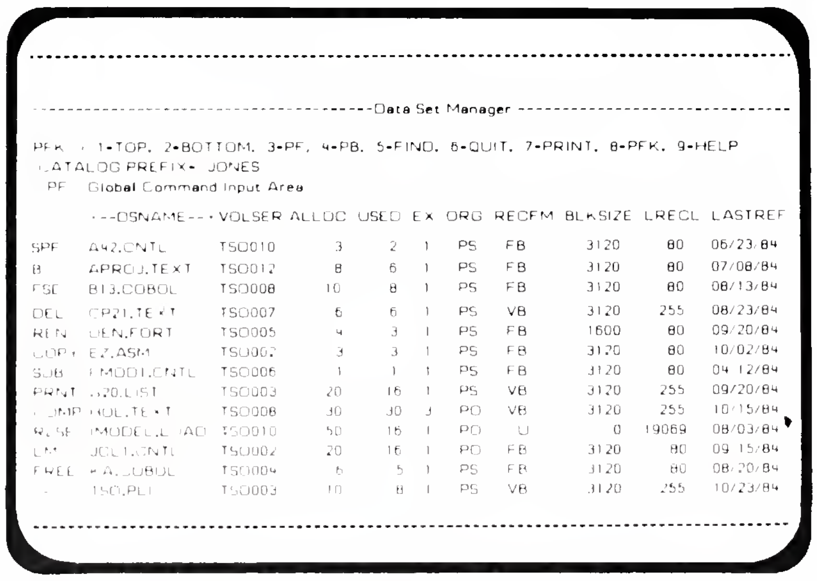

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---------------------------------Data Set Manager ------------------------------

PFK : 1=TOP, 2=BOTTOM, 3=PF, 4=PB, 5=FIND, 6=QUIT, 7=PRINT, 8=PFK, 9=HELP
CATALOG PREFIX= JONES
 PF   Global Command Input Area

      ---DSNAME--- VOLSER ALLOC USED EX ORG RECFM BLKSIZE LRECL LASTREF

SPF   A42.CNTL     TSO010     3    2  1  PS   FB    3120    80  06/23/84
B     APROJ.TEXT   TSO012     8    6  1  PS   FB    3120    80  07/08/84
FSE   B13.COBOL    TSO008    10    8  1  PS   FB    3120    80  08/13/84
DEL   CP21.TEXT    TSO007     6    6  1  PS   VB    3120   255  08/23/84
REN   DEN.FORT     TSO005     4    3  1  PS   FB    1600    80  09/20/84
COPY  EZ.ASM       TSO002     3    3  1  PS   FB    3120    80  10/02/84
SUB   FMOD1.CNTL   TSO006     1    1  1  PS   FB    3120    80  04/12/84
PRNT  J20.LIST     TSO003    20   16  1  PS   VB    3120   255  09/20/84
COMP  HOL.TEXT     TSO008    30   30  3  PO   VB    3120   255  10/15/84
RLSE  IMODEL.LOAD  TSO010    50   16  1  PO    U       0 19069  08/03/84
LM    JCL1.CNTL    TSO002    20   16  1  PO   FB    3120    80  09/15/84
FREE  KA.COBOL     TSO004     6    5  1  PS   FB    3120    80  08/20/84
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Computerworld (ISSN-0010-4841) is published weekly, except: January (5 issues), February (5 issues), March (5 issues), April (6 issues), May (5 issues), June (5 issues), August (5 issues), September (6 issues), October (5 issues), November (5 issues) and a single combined issue for the last week in December and the first week in January by CW Communications/Inc., 375 Cochituate Road, Box 880, Framingham, Mass. 01701.

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Computerworld can be purchased on 35 mm microform through University Microfilm Int. Periodical Entry Dept., 300 Zeeb Road, Ann Arbor, Mich. 48106. *Computerworld* is indexed: write to Circulation Dept. for subscription information.

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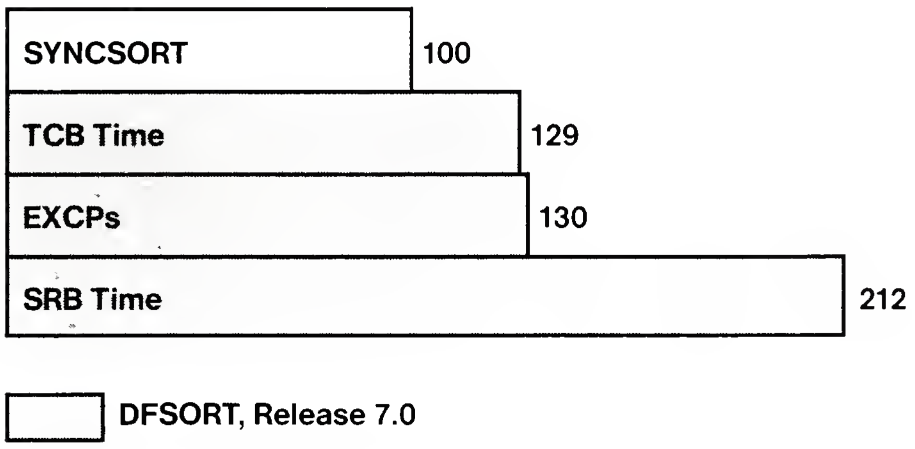
There is no joy in Armonk! DFSORT7 struck out every time it came to bat against the latest release of SyncSort (Release 2.SE) in a recent series of MVS benchmark tests. (In sorting, as in most other forms of human endeavor, it's a long way from *baby* to *Babe*.)

The bar charts below tell the story more eloquently than we can:



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Ex-Honeywell site staff aims at IBM world

By Charles Babcock
CW New York Bureau

EDISON, N.J. — After two hours of IBM CICS formatting instruction, the roomful of students — all experienced Honeywell, Inc. users — were still paying rapt attention.

CICS does not run on Honeywell computers, and most members of the class had yet to spend a day with an IBM mainframe, but they recognized the value of the training. It was a lifeline cast to them after they were dismissed from their jobs at Hoffmann-LaRoche, Inc., a N.J. pharmaceutical company. Hoffmann-LaRoche is a Honeywell shop, and its former employees have found themselves suddenly adrift in a predominantly IBM world, class members said.

On Feb. 4, Hoffmann-LaRoche cut its staff by 1,000 — after its patent expired on Valium and Librium, drugs that at one time were the No. 1 and No. 2 best-sellers in the U.S. With nothing to replace them, the firm decided it needed to cut costs by $50 million, company officials said.

The cuts were made across the board, a Hoffmann-LaRoche spokesmen said, although the former employees

See **CUTS** page 8

Basic skills transferable, headhunters say

PARAMUS, N.J. — Placement professionals said Honeywell, Inc. skills can be transferred to an IBM environment, provided the skilled person can find someone to hire him.

It would take "no more than two to three months" for someone trained on Honeywell systems to learn a new environment, said Norman J. McLaughlin, DP placement manager at Robert Half of Boston, Inc.

For that matter, there are many openings for Honeywell-experienced people in the Boston area, McLaughlin said.

But other placement experts were less optimistic that the MIS staff members caught in a cutback at Hoffmann-LaRoche, Inc. in New Jersey would be able to find a job.

It is not difficult to transfer skills from one system to another, said Robert W. Shields of Robert Shields & Associates of Houston, but there are few jobs to choose from among the non-IBM vendors.

"If you have 100 programmer jobs open, 85 to 90 will be IBM," he said. Finding jobs for people with experience on Control Data Corp., Honeywell or Sperry Corp. machines is easier than for those with experience from other vendors because their equipment often coexists with IBM's. When it comes to Burroughs Corp. or NCR Corp., however, "forget it," Shields said.

The best approach for the former Hoffmann-LaRoche employees is to seek jobs in combined Honeywell-IBM shops where their Honeywell experience will be valued and they will get a chance to learn IBM. There are very few such jobs in the Houston area, he said.

A third placement official said the real issue may not be Honeywell vs. IBM experience. It may be the age and salary level of the former Hoffman-LaRoche employees.

"I'm familiar with the Hoffmann-LaRoche situation. They are good, solid people but not great," said Herbert Z. Halbrecht of Halbrecht Associates, Inc. of Stamford, Conn.

The Hoffmann-LaRoche systems programmers and program analysts were well-paid individuals who are going to have a tough time convincing an employer to both hire and train them at their present salary level, Halbrecht said.

"When the market gets a little soft, companies look for the best people — the stars," but when they look at middle-aged people, they ask whether they haven't already peaked, he said. "It's not a good time to be 48 or 50 and not have made it pretty big," he added.

At a class for the former Hoffmann-LaRoche MIS workers, Edward G. Weite noted that one of the dismissed employees was 56. "What's he going to do?" he asked.

Weite, 52, one of the few terminated workers to find a job, said he did so by taking "a cut in status and pay" and by looking for a job before the cuts were announced.

— **Charles Babcock**

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DORBANDT from page 1

senior group manager in systems development in charge of the information center; he was one of the highest level computer managers let go.

Being out of a job "was a shock," even though Dorbandt, unlike many of his coworkers, had told himself it might happen. Hoffmann-LaRoche had warned six months earlier that cuts were coming, without indicating who would be affected.

When he was let go, Dorbandt found he had prepared himself better than he had prepared his wife and two teenage daughters. One of his key strategies — for them as well as for himself — was to continue his daily routine. Each morning since Feb. 4 he has left for work, although now "my job is looking for a job.

"In retrospect, it's a new lease on life," he said.

"Hoffmann-LaRoche is no longer a growing company. There simply isn't the opportunity there anymore," said Dorbandt, who is looking for a director-level job in a strong company. "I've played all the instruments. It's time to lead the orchestra."

Dorbandt started out with Hoffmann-LaRoche as a systems programmer. As a group manager, he directed much of its third-generation software development in finance, marketing, research and engineering, he said.

At a time when Digital Equipment Corp. had produced only a handful of its VAX minicomputers, Dorbandt decided they would be "a fundamental research engine" and committed Hoffmann-LaRoche's research arm to using them, he recounted.

Dorbandt said it was "a natural migration" from minicomputers to microcomputers and became the director of the information center, supervising six people and training 700 employees to use IBM Personal Computers.

Not all of this experience is instantly marketable, however, since Hoffmann-LaRoche uses Honeywell, Inc. mainframes, and there are few other Honeywell sites in the metropolitan New York area.

"It's an IBM-oriented marketplace, and I am directing my efforts with that in mind. One of my long-term objectives has been to get into the IBM mainstream," he said.

Still, he said he is "looking for opportunity rather than a particular piece of iron."

Skills transferable

Unlike many former Hoffmann-LaRoche programmers and systems analysts, Dorbandt said he believes his skills as a manager "transcend technical details and are transferable" to non-Honeywell sites.

Even those with skills that are primarily technical should not worry about eventually finding another job, he said.

As for his own search, Dorbandt has the services of a placement agency, secretaries and counseling, paid for by Hoffmann-LaRoche, and he combs the want ads of trade magazines and newspapers.

But he said the real search probably is going on through business associates with whom he has been in contact.

"For a lot of people, this is going to be a real mid-life kicker. It is going to give them the chance to renew their skills and their confidence in themselves," he said.

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MANAGEMENT SUMMARY

FDR (formally known as Fast Dump Restore) is a dump and restore utility designed to reduce the time required to produce a dump and restore the data. FDR replaces all standard IBM dump/restore utilities, supports all VS1 and MVS (XA) environments, and can be used with most IBM and compatible disk devices.

FDR uses three method plans in attaining input/output efficiency: 1) the use of increased blocking factors, 2) the elimination of redundant and unnecessary data, and 3) the use of cylinder orientation to minimize delays due to physical rotation, arm movement, and so on. FDR also offers a performance option (BUFNO=MAX) that increases the number of buffers FDR uses during the dump operation, and is designed to decrease elapsed time and save system resources. FDR has a full-volume disk-to-disk feature.

FDR includes a *Stand-Alone Restore* (SAR) program. This program allows restoration of a full-disk volume when, due to the unavailability of a VS1 or MVS operating system, FDR cannot be run. SAR can also be used to restore partial volumes and to clip a volume. SAR also aids the operator by issuing prompting messages on the console and error messages on the console, printer or tape whenever a problem is encountered during the restore. SAR also permits the Restore of specific tracks.

Recent enhancements to SAR include support of stand-alone operations in MVS/XA mode, a standalone backup capability, and support of backup and restore functions under VM.

A no-charge option available to FDR users is the *Data Set Functions* (DSF) subsystem. DSF allows the user to dump and restore individual data sets on a pack and to dump and restore by absolute tracks. It can also be used to restore data sets from full-volume FDR backup tapes and allows the user to rename a data set when restoring it. Password protection is provided, and can be activated on either a volume or data set basis.

Compaktor (CPK), an extra-cost option, is a disk management utility used to reorganize direct-access volumes using the FDR methodology. It reduces space fragmentation, merges data set extents, aids in positioning data sets, and offers several other solutions to frequent disk pack organization problems.

Automatic Backup and Recovery (ABR) is another extra-cost option that manages disk space on direct-access volumes. Disk volume and data set backup can be automated based on the last reference date and update characteristics. Data sets that have not been used for a time period can be automatically archived, freeing the disk space for more productive use. Reports can be tailored to user specifications. A Data Set Not Found Exit permits the Automatic Restore of data sets that have been archived without user intervention. The vendor recently released extensive ABR panels for TSO users. The panels provide complete dataset and volume reporting, thus permitting end users more direct control over their datasets. ABR is designed to operate with both the DSF and Compaktor subsystems.

FDR provides enhanced support for VSAM files which are cataloged into an ICF catalog. These data sets are also relocatable with DSF and ABR.

COMPETITIVE POSITION

While the packages listed on page one of this report compete with the FDR/Compaktor/ABR products, the only competition for FDR itself is IBM's DF/DSS. FDR is more efficient than the IBM product. This, along with its reliability, account for FDR's very extensive user base.

The other products listed as competition are disk space management packages and thus compete with ABR. The main competition includes Cambridge's ASM2 and Sterling's DMS/OS. While both of these products were introduced several years before ABR, neither has as large a user base. In addition, they are both more expensive than ABR.

The FDR/Compaktor/ABR family of products holds a very strong market position that is likely to continue. The family provides outstanding performance and reliability, and the vendor has earned a reputation for quality control that is equalled by few in the industry.

ADVANTAGES AND RESTRICTIONS

FDR, as its name implies, is a fast method for dumping and restoring data. The package is faster and more efficient than similar IBM utilities, and achieves a high performance level, reducing elapsed time and saving system resources.

A major advantage is the Stand-Alone Restore program. The ability to backup and restore disk volumes without an available operating system is critical to disaster recovery. The automatic restore to unlike devices and the automatic restore of archived files are additional advantages.

Another major advantage is the outstanding reliability of both the product and the vendor, as attested to by the rating in Table 1 and the wealth of comments from users. Many consider FDR the most reliable software package they have ever used, with never a bug to be found. Another decided advantage of FDR is the free 90-day trial offering.

USER REACTION

Twenty-three users of FDR responded to an independent Datapro survey. The average age of installation was 4½ years. The utility was running on various IBM mainframes as well as on an Amdahl 5860 and three NAS models. All but one were running under MVS, MVS/SP, or MVS/XA. Not every respondent rated all categories. Six did not rate User education, explaining that none is available.

TABLE 1.	Excel.	Good	Fair	Poor	MAUR*	CA**
Reliability	23	0	0	0	4.00	1
Efficiency	19	4	0	0	3.83	1
Ease of installation	20	3	0	0	3.87	1
Ease of use	12	10	1	0	3.48	1
Troubleshooting	19	3	0	0	3.86	1
Documentation	10	9	3	1	3.22	1
User education	5	4	6	2	2.71	2
Vendor's maintenance	14	7	0	0	3.67	1
Overall satisfaction	17	5	0	0	3.77	1

*Mean Average User Rating, on a scale of 4.0 for Excellent.
**Cluster Analysis—the range of average user ratings attributed to each cluster for each category, where Cluster 1 is the highest and Cluster 4 is the lowest. (See Report 70E-010-40 for individual category Cluster allocations.)

These users overwhelmingly stressed the advantages of FDR. All 23 said the package performed as promised by the vendor. Many comments were made regarding the outstanding reliability of the package, with long-time users saying that they have never had any problem with FDR. They consider IDP the most reliable software firm they have ever dealt with, with one commenting: "I wish some of the big name software folks took some lessons in quality assurance from Innovation." This is also reflected in the table above, with reliability receiving a very rare 4.00 rating.

Twenty users said FDR saves system resources, 18 said it saves staff time, 12 considered it inexpensive, and 16 said that using FDR resulted in financial savings for their companies. Fourteen considered the package simple to operate and 10 said it is flexible in its capabilities, allowing different device migration, archiving, single dataset restore, and global functionality.

Several users praised the vendor for providing excellent technical support. IDP is very responsive to problems or questions and the support staff is very well trained with thorough knowledge of the internals of FDR and MVS. In addition, IDP is quick to upgrade their product as soon as IBM announces any new hardware or system modifications. Furthermore, the vendor is continually improving and enhancing their products' capabilities.

Few restrictions were mentioned. Two users considered FDR complex and one said it is inflexible, while another said that the migration facility for data set movement to unlike devices is slow. One user said the documentation is poorly organized, while the user who rated documentation poor commented that there is no overall description of how all the components of the package fit together. As a result of this, much time is spent flipping through the manual to determine what is needed to carry out a requested function. A vendor spokesman explained that reorganization of the documentation is difficult because some users have only one component of the product. While there are no major plans for changing the documentation, the vendor is currently adding more examples of how to use the product. ☐

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BYPASS

from page 1

now," noted Seth Lewis, manager of telecommunications with Home Insurance Co., a property and casualty insurance firm headquartered in New York. To justify such a system, it "would have to offer something else besides potential cost savings, such as improved speed, response time, performance or quality."

Throw-away money

Obviously, the shorter the payback and the longer the system can be used, the better. With bypass, however, the up-front costs might be throw-away money, according to William E. Kane, director of telecommunications for SEI Corp., a Wayne, Pa., company that provides computer services for investment firms.

"I can spend $50,000 [on a bypass system] now and find out in 18 months that the company I did business with has been purchased or has run out of funds or that the technology and my internal needs have changed far enough that I can't use it anymore," Kane said. "If I can use the system for five years — which is a long time in this industry — then it becomes reasonably easy to justify. But if you're on the borderline between two or three years, it's hard to make an economic justification for it."

Others agree. "If you can't justify the fact that [the bypass system] is going to be a good technolgoy two to three years from now, how are you going to [justify] it in five years?" said Dohn Kivett, vice-president of telecommunications with Wachovia Corp., a bank with 200 offices in North Carolina. "You're going to have to live with that system for a while once you install it."

Advantages questioned

Kivett does not know if there are any great advantages to be gained at this point by implementing a bypass system. Wachovia's network consists of roughly 400 leased lines within North Carolina, where "services are reasonably priced and service and response has been good," Kivett said. "If local mileage rates continue to increase, that might make bypass more attractive."

Bypass attractiveness varies by state, given variants in rates, applications (voice/data, local or long distance), acceptable level of service (availability, reliability and error rates), availability of alternatives and by the technologies for implementing such systems.

SEI and Home Insurance, for example, have each considered turning out their local loops in favor of direct links to AT&T Communications central offices.

Home Insurance operates a network of roughly 120 multidrop analog leased lines that tie its New York offices with remote branch offices and agents. "The most effective type of bypass for us would be to get some kind of T1 links . . . directly to AT&T to take out the local loops," Lewis said. "But we couldn't justify all the new hardware we would need" to terminate the high-speed digital facilities, he added.

Home Insurance ruled out the use of a microwave link to AT&T because "the network is critical for us and we couldn't take the chance of any increased downtime that we would potentially be exposed to with a microwave shot in downtown New York," Lewis said.

Local loop alternative

SEI is also considering bypassing the local loop by installing multiple T1 spans between its facilities and the AT&T switching offices that terminate its network of 500 to 600 leased lines. AT&T has done a preliminary study of SEI's facilities, and Kane is waiting for the results. "If it's anywhere close to economical, it would be beneficial for me to get rid of those local loops." This would eliminate finger pointing between the local and long-distance carriers when circuit problems arise, Kane said.

If SEI implements the T1 links, its local telephone company would not totally lose out. Unlike some corporations that install private facilities directly to long-haul carriers [CW, April 15], AT&T would probably contract with SEI's local telephone company to provide the circuit. Typically, however, the price of 15 leased lines is the same as that of a T1 link that provides 24 leased-line equivalents, meaning the local company would lose some revenue.

The options available for local bypass — links to long-distance carriers, private microwave, infrared or point-to-point cable between buildings — are not feasible for long-distance bypass. The only viable way to get around long-haul common carriers today is to install private satellite networks.

You have to worry about the inherent delays with satellites, Sprouse warned. "If you add just a second of holding time on each call, then you can start blocking other calls," he maintained.

Users who do not have the concentration of traffic needed to justify bypass may still be able to capitalize on the technology. "Our initial judgment is that bypass is not meant for users of our geographical structure," said Kerry Overlan, corporate telecommunications and OA director with United Fruit Co. in Boston.

BANKS

from page 1

chines, the banks improved customer service and found customers making smaller and more frequent transactions with no net gain for the bank. If fewer tellers were employed, more high-cost computer specialists took their place, said Phillip Strause, a senior consultant.

In effect, the banking executives surveyed have allowed themselves to be driven by the new technology, incorporating it into their operations but not planning increased returns from its use.

"Computers have made banking more efficient, but banks haven't been able to get people to pay for it," Strause said.

CUTS

from page 6

claim any department not tied to operating revenue suffered heavily, including MIS systems development.

"None of these people were terminated for performance reasons. They were all absolutely proficient in Honeywell systems," said Frank Falconieri, an official at Passaic County College in New Jersey who helped set up the CICS course.

Nevertheless, the former Hoffmann-LaRoche employees said they are finding their experience of little value in looking for a job; sometimes it is even a hindrance.

"Honeywell has great, modern facilities, but they don't have too many users around here," said Theodora H. Ongkingco, 45, a Rutherford, N.J., programmer analyst. Because she arrived to work early Feb. 4, she was the first MIS person dismissed, she said.

"There are a lot of large organizations that need management support — and they're not Honeywell [sites]," said Thomas M. Downie, 44, of Park Ridge, N.J., who spent 10 years in management support services at Hoffmann-LaRoche.

"I want to get into the IBM environment. Seventy percent of the world is IBM, and it behooves us to recognize it," said Frederick M. Hendricks, a former staff manager in systems development with 25 years experience at Hoffmann-LaRoche.

The Edison class in CICS was set up to help the former Hoffmann-LaRoche employees transfer their Honeywell knowledge into a common IBM environment. It is being financed by the Private Industry Councils of several counties and Passaic College.

Some class members, however, wondered if training in CICS would be enough.

"I don't even mention Honeywell. It's considered practically obsolete at many companies," said Celia A. Hines, of Morris Plains, N.J., who rose from programmer to a manager in the information center during 11 years at Hoffmann-LaRoche. Still, she said, Honeywell is there on her resume and prospective employers lose interest during interviews when they spot it, she said.

Ongkingco said she answered an ad for someone to be trained as a programmer analyst in IBM systems, only to be told the company wanted to train someone who already had IBM programming experience.

"The software is changing so fast. Sometimes the old experience isn't too good for you," said Spencer S. Chang, 49, of Parsippany, N.J., a program analyst.

"All of the IBM manuals are written in IBM acronyms. They're so different" from Honeywell terminology, noted A. Lance Zaremba, a computer security specialist who said he was never busier than during the last few weeks of his job.

Despite the obstacles, many former Hoffmann-LaRoche employees said the Cobol skills they developed carry over to IBM environments after the the employee learns IBM terms.

Downie, who had experience on IBM systems before joining Hoffmann-LaRoche, said he felt he could be productive within a few weeks after joining a firm.

One of the former Hoffmann-LaRoche employees said he lost out on a job at another Honeywell shop and it is just as well. "If I had gotten it, I would just be back in the pickle," said Edward G. Weite, one of the few people who has found work since the cuts.

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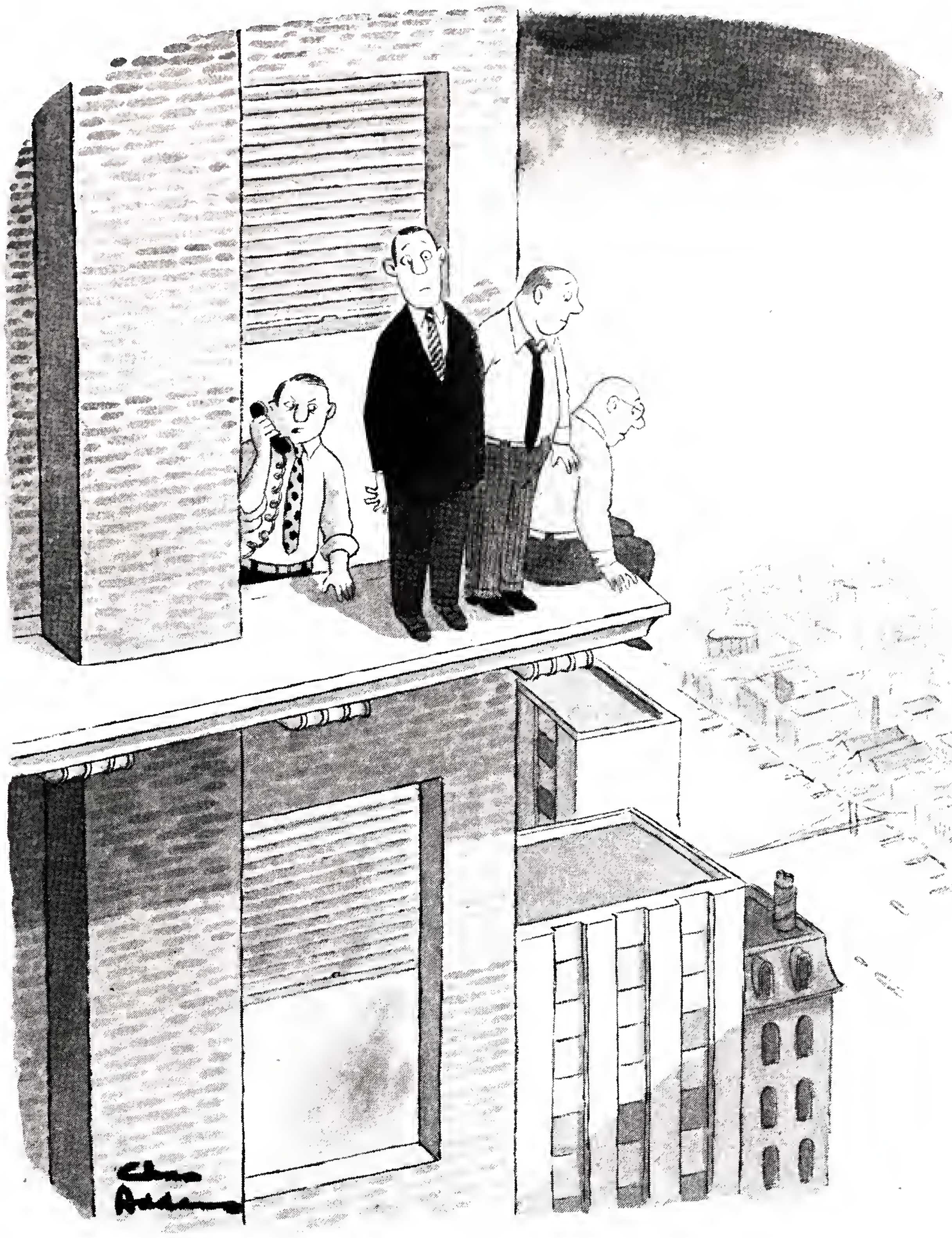

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Xerox unveils micros, software, laser printers for office

By Edward Warner
CW Staff

NEW YORK — A fleet of products targeted at the office work group — including five personal computers, a software series and two laser printers — was unveiled here by Xerox Corp. last week

The personal computers all are said to offer IBM Personal Computer compatibility and run the Microsoft Corp. MS-DOS operating system. Four of the five are manufactured by Ing. C. Olivetti & Co., the Italian firm that builds the AT&T 6300 personal computer. The fifth, priced at $4,995, reportedly offers 1.1M byte of memory and the windowing and mouse-driven features normally associated with much higher priced Xerox Star systems.

Like the AT&T 6300, the four Olivetti machines use an Intel Corp. 8086 family microprocessor. Two of the four, the 6064 and 6065, reportedly include a keyboard, monitor and 256K bytes of memory. The 6064 includes twin diskette drives and is priced at $2,888. The 6065 offers a single diskette drive and an internal 10M-byte hard disk and is priced at $4,485. Both will be available in the U.S. within the next three months.

The other 8086-based machines, the 6067 and the 6068, reportedly feature greater memory, bundled Xerox word processing software and specially designed word processing keyboards. The 6067 is offered with Xerox Writer I software and includes twin diskette drives, 384K bytes of memory, a 640- by 400-pixel display and a price of $2,985.

The Xerox 6068, meanwhile, offers the same display, 512K bytes of memory, a 10M-byte hard disk and Writer II, a more sophisticated word processing package. The 6068 is priced at $5,150. Both machines will be available in the third quarter.

The fifth machine in the rollout, the Xerox 6085, debuted along with a software series for it that includes a windowed environment and mouse-driven functions. With a built-in 10M-byte drive, 15-in. display and 1.1M bytes of internal memory, the 6085 carries a standard version price tag of $4,995. Included in the 6085, available in September, are a keyboard, mouse and two RS-232C ports.

Introduced with the 6085 was Viewpoint series software, including a $125 Viewpoint windowing environment. Viewpoint reportedly contains the Xerox Pilot operating system and serves as the cornerstone for use with the other packages in the Viewpoint series. The packages will be priced from $35 to $995. The entire Viewpoint series will be available in September, a Xerox spokesman said.

Two laser printers, a high-end and a low-end model, were also unveiled. The high-end Xerox 3700 reportedly prints at up to 24 page/min and includes a 10M-byte hard disk that can store up to 2,000 pages and receive print jobs from a host computer. The 3700 features RS-232C and Centronics Data Corp.-type parallel interfaces. It is priced at $29,995 and, with Xerox controllers, can support IBM communications protocols including Systems Network Architecture/Synchronous Data Link Control.

At the low end, the $4,995 Xerox 4045 Laser CP claims a 10 page/min printing rate and the ability to store up to 128 different type fonts. Included are both parallel and RS-232C interfaces, along with 128K bytes of memory, expandable to 384K bytes. The Laser CP can print documents created on a micro using software designed for printing on a Xerox 2700 II electronic printer or a Xerox Diablo 630 daisywheel printer. Xerox said the Laser CP will be available in the third quarter in some U.S. cities.

Xerox is located at Xerox Square 006, Rochester, N.Y. 14644.

Microsoft rolls out spreadsheet

BELLEVUE, Wash. — Microsoft Corp. last week introduced a spreadsheet for the Apple Computer, Inc. 512K-byte Macintosh micro that reportedly incorporates business graphics and a data base.

Called Microsoft Excel, the spreadsheet reportedly offers 16,384 rows by 256 columns — over four million cells — and two-way file compatibility with Lotus Development Corp.'s 1-2-3. Users may also create macro programs using a built-in recorder that creates the macro while the user carries out applications.

The Excel spreadsheet, which costs $395, reportedly will come bundled with Apple Switcher, a program developed by Apple that allows users to switch between Macintosh applications. Apple Switcher, not yet formally announced by Apple, will permit users to have both Excel and Microsoft's Word in memory and to switch and exchange data.

Excel will be available in September. Current owners of Microsoft's Multiplan for the Macintosh can upgrade to Excel for $200. Owners of both Multiplan and Microsoft's Chart for the Macintosh can upgrade for $100. Microsoft can be reached through Box 97200, 10700 Northup Way, Bellevue, Wash. 98009.

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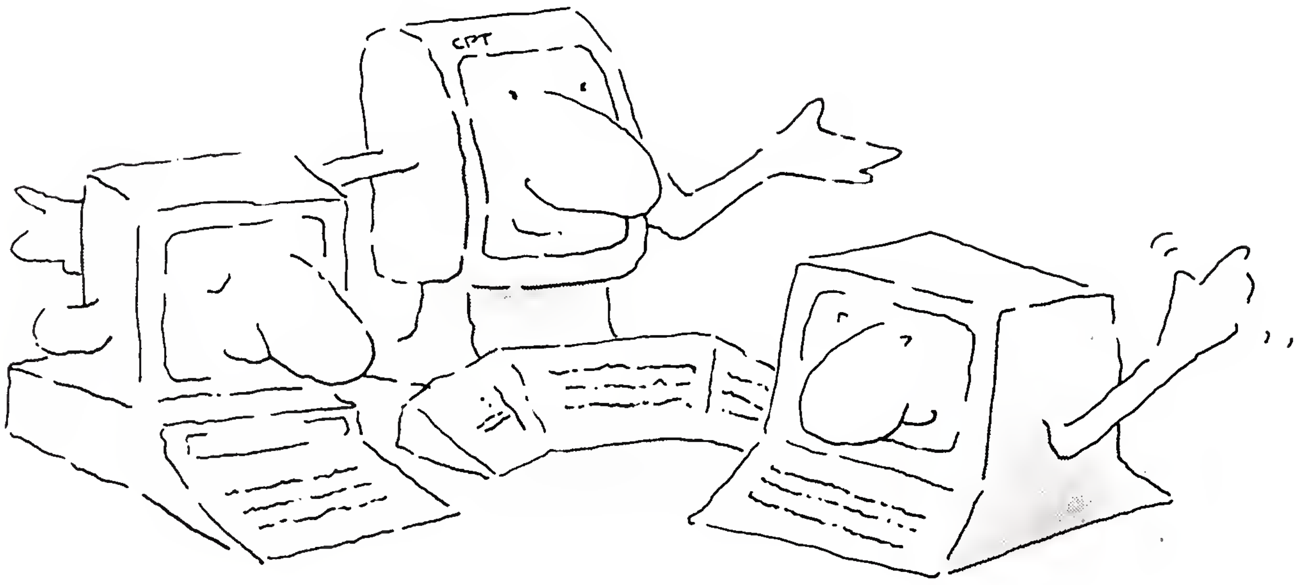

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Compaq launches IBM AT-compatible family

HOUSTON — Compaq Computer Corp., the largest supplier of IBM Personal Computer compatibles, launched its long-awaited line of Personal Computer AT-compatible systems and cut prices on existing models here last week at its annual meeting.

The systems run up to 30% faster than the IBM Personal Computer AT and offer a range of options, the firm said. Both portable and desktop versions carry a starting price of $4,499 and are available immediately.

Compaq claimed that the Compaq Portable 286 features IBM AT compatibility, an optional 20M-byte hard disk drive, an optional internal tape backup system and the ability to handle up to 2.6M bytes of random-access memory (RAM). Exactly the size of the original Compaq Portable Personal Computer, the machine weighs 30 pounds.

Like the Portable 286, the Compaq Deskpro 286 is based on an Intel Corp. 80286 chip running at either 6 MHz or 8 MHz. The system reportedly offers up to 8.2M bytes of RAM, 70M bytes of hard-disk storage and space for four internal storage devices.

Analysts react favorably

Industry analysts and dealers generally gave the introductions high marks. By offering a compatible system with unique enhancements, Compaq is "repeating its success with the [IBM Personal Computer] and the XT," said Chris Steitz, senior analyst at Infocorp, who predicted that 35,000 of the new systems will be sold this year.

"This lets them keep up with their game of follow the leader," said Michael Geran, vice-president for research at E. F. Hutton & Co. "They've got momentum."

Like others, however, Geran said the window of opportunity created by slow AT deliveries is closing, and IBM's potential economies of scale threaten to crush compatible suppliers.

The high-end systems are said to work with popular software programs, hardware peripherals and add-ons for the AT.

The Compaq Portable 286 Model 1 features 256K bytes of RAM, a 1.2M-byte diskette drive, a 9-in. high-resolution text/graphics monitor, keyboard, parallel and serial ports, security lock and three expansion slots. It also has interfaces for red-green-blue, composite video or TV monitors. The Model 2, similar except for offering 640K bytes of RAM, a 20M-byte hard disk drive and two expansion slots, will sell for $6,299.

Options include an $899 10M-byte tape backup system, a $1,095 512K-byte added memory board, a second 1.2M-byte diskette drive priced at $650, a 360K-byte diskette drive that costs $350, a $2,095 20M-byte hard disk drive and MS-DOS 3.0 and Basic software for $65.

The Compaq Deskpro 286 Model 1 includes 256K bytes of RAM, a 1.2M-byte diskette drive, five available expansion slots, space for four half-height internal storage devices, security lock, parallel and serial ports and monitor interfaces. The $4,499 standard price includes an optional $255 12-in. text/graphics monitor. The Model 2 provides 640K bytes of RAM, a 30M-byte hard disk drive and four available expansion slots. It costs $6,254 with monitor.

Last week Compaq also dropped prices on all existing models except the single floppy disk drive Portable Personal Computer and Deskpro Model 1, which analysts agreed was a logical repositioning move.

The price of the standard portable with dual floppy disk drives was reduced to $2,699 from $2,995, and the cost of the Compaq Plus Portable Computer dropped to $3,999 from $4,995. Prices for Deskpro models (with monitors) dropped as follows: Model 2 to $2,899 from $2,995; Model 3 to $4,499 from $4,995; Model 4 to $5,799 from $7,195.

Compaq is located at 20555 FM149, Houston, Texas 77070.

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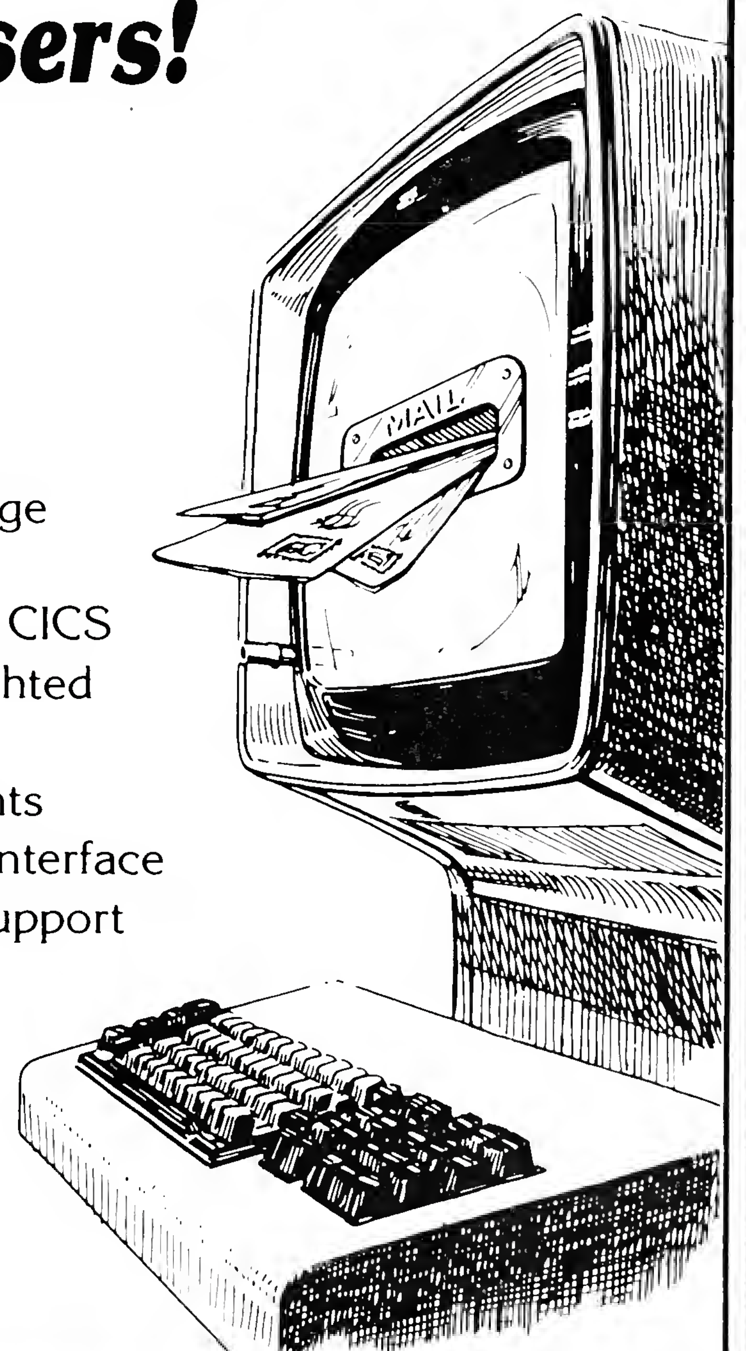

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ADR cuts path to Datacom/DB from IBM's IMS, DL/1

By John Gallant
CW Staff

NEW YORK — Applied Data Research, Inc. (ADR) gave IBM IMS and DL/1 users an automated pathway into the world of relational data base management system technology with the introduction last week of a system that migrates existing IMS/DL/1 applications to ADR's Datacom/DB without reprogramming.

ADR's DL1 Transparency reportedly allows IMS or DL/1 programs to operate against the Datacom/DB relational DBMS without changes to program logic. The system intercepts DL/1 or IMS requests and automatically translates them for processing by the relational DBMS.

An ADR spokesman said DL1 Transparency reduces the effort required to convert from the older IBM DBMS technology to a relational DBMS — an effort that involves rewriting program source code, recompiling programs and redesigning the data base. In addition, purchased applications software designed for IBM DBMS can be run against Datacom/DB through DL1 Transparency.

DL1 Transparency is said to provide a completely automated migration from an IMS or DL/1 environment to Datacom/DB through the following four subsystems:

■ Relational Data Base Design, which creates definitions for Datacom/DB data bases from existing DL/1 definitions. It also automates the population of the ADR/Datadictionary, which allows users to utilize ADR's Ideal applications development system, Dataquery query language and PC Datacom micro-mainframe link.

■ Data Restructure, which reads all designated logical and physical IMS or DL/1 data bases and converts them, reportedly in a single pass, to Datacom/DB data bases.

■ Intercept, which, at program execution time, takes control of the IMS or DL/1 environment and determines which of the IBM DBMS calls are to be processed using Datacom/DB data bases. This subsystem also supports mixed-mode processing involving both IMS or DL/1 and Datacom/DB, allowing a phased transition of applications.

■ Transparency, which reportedly traps IMS or DL/1 calls from the applications and automatically generates appropriate Datacom/DB calls. Also, Datacom/DB return codes are translated to corresponding IMS or DL/1 codes and returned to the applications. This subsystem of DL1 Transparency reportedly allows applications to run against Datacom/DB without modification. ADR President Martin Goetz said DL1 Transparency offers an alternative for users of IBM's older IMS or DL/1 technology who are not convinced of the capabilities of IBM's DB2.

Stephen Gerrard, vice-president and director of product marketing for ADR, said 65% of IBM mainframe sites with a DBMS use IMS/DB or DL/1 — a figure that translates to roughly 10,000 user sites. International Data Corp., a Framingham, Mass.-based market research firm, estimates the percentage slightly lower at just over 62%. Gerrard said DL1 Transparency is aimed at that audience.

DL1 Transparency was introduced to beta test in September and is now available to selected customers, according to ADR. General availability is slated for the third quarter.

DL1 Transparency runs under IBM's OS/VS1, MVS and MVS/XA in CICS/VS, batch and shared mode. It costs $40,000 for OS environments and $30,000 for DOS.

ADR is located at CN-8, Rt. 206 and Orchard Road, Princeton, N.J. 08540.

DL1 Transparency seen appealing to narrow audience

By John Gallant
CW Staff

Applied Data Research, Inc.'s (ADR) DL1 Transparency could prove to be an important new technology — provided users have tired of Big Blue's aging data base management systems, have decided to make the switch to a relational DBMS and are unhappy with IBM's DB2 strategy. But analysts and IBM DBMS users interviewed by *Computerworld* questioned whether those conditions exist today.

Introduced last week, DL1 Transparency allows IBM IMS and DL/1 users to run existing applications against ADR's Datacom/DB relational DBMS without reprogramming. Users and analysts agreed that a manual conversion from a hierarchical to a relational DBMS would require a huge investment of time, money and manpower. Thus, they said, the product could be of value to users considering Datacom/DB for both production and information center requirements. Beyond that specific audience, however, DL1 Transparency may meet with only limited success.

"Anything that eases a conversion effort gets our attention," said G. E. Bachman, manager of computer services for Wichita, Kan.-based Beech Aircraft Corp. The firm runs more than 20 applications under IMS on an IBM 3084 mainframe.

"But it would only be important if we were to switch to a relational system," he added. "We have not seen enough advantage in going to relational. We think IMS will hold up well for at least the next few years."

Bachman's sentiments were echoed by Bruce Johnson, manager of data base operations at Westinghouse Electric Corp.'s corporate data center in Pittsburgh. Westinghouse runs IMS under MVS/XA on an IBM 3081 processor.

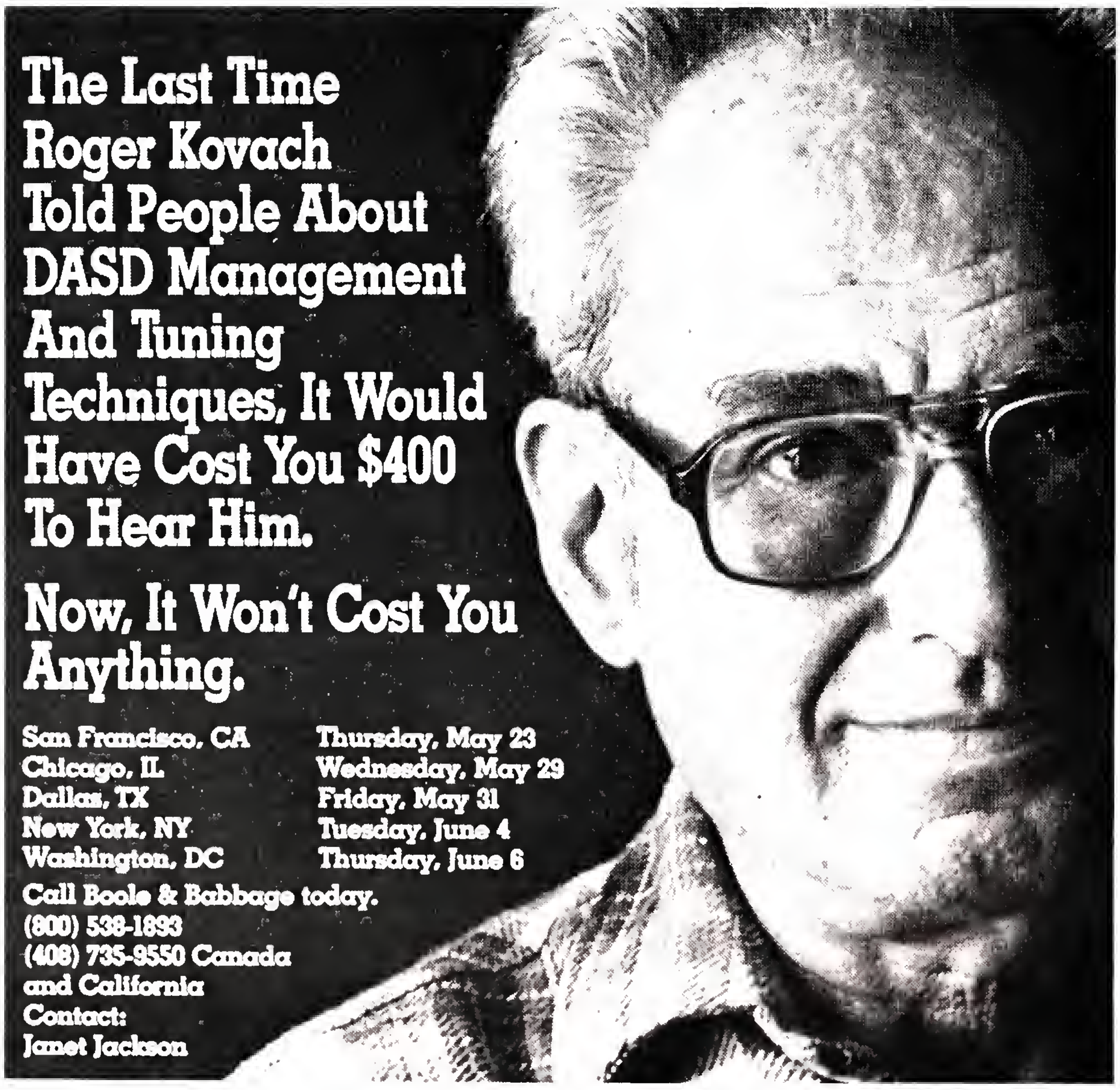
"We are not interested in moving to a relational system, but we are following the progress of DB2," he said. "If we move to relational we will be more inclined to consider IBM's product first."

Even users who have decided to go with relational do not necessarily see conversion as a problem. Carl Baxley, MIS manager for Towson, Md.-based Bendix Corp., said his company is lessening its reliance on IMS and moving to Cullinet Software, Inc.'s IDMS, which offers relational capabilities. But instead of a massive reprogramming of applications, Baxley said, Bendix is replacing older, IMS-based systems with newly purchased, IDMS-compatible packages.

Westinghouse's Johnson said IBM's current dual-DBMS strategy, which emphasizes the use of IMS for production systems and DB2 for information center needs, has not caused any concern. At the introduction of DL1 Transparency, ADR officials intimated that users were unhappy with the prospect of maintaining and paying for two DBMS — a charge other observers have also leveled against IBM. But, Johnson said, "IBM's strategy makes sense to us."

Steven Pfrenzinger, president of Encino, Calif.-based IMS Consulting, Inc., agreed. "There are some frustrated DL/1 users who will see ADR's announcement as a real opportunity. But I think most customers see fewer reasons to leave the IBM fold in light of what is happening with DB2."

According to Pfrenzinger, early users of DB2 are enthused about its capabilities, and IBM is actively addressing problems that have cropped up in DB2 thus far. "Users are concerned about the two-DBMS strategy, but both they and IBM are also looking to DB2 to handle everything in the near future," he said. That ADR's timing may have been off was also the opinion of William Inmon, a director at Coopers & Lybrand in Denver. "Three years ago, the market for this type of product was ripe," he said. "But the people who would have gone to Datacom/DB are now being shepherded to DB2. IMS users have been told by IBM that DB2 is the way to go."



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FCC approves AT&T's private-line rate restructuring

WASHINGTON, D.C. — The Federal Communications Commission allowed AT&T's far-reaching restructuring of private-line rates to go into effect last week, subject to further investigation and monitoring for potential service delays and bypass developments.

The effect of the changes would be to raise average private-line customer rates immediately, especially for voice-grade calls within a 50-mile radius. However, some categories of private-line service, such as Dataphone Digital Service rates, would drop in cost [CW, Jan. 28 and March 18].

The private-line rate restructuring reflects the changes brought by the breakup of AT&T and the divested regional Bell operating companies, along with the implementation of an access charge system.

During the past 18 months, the FCC and AT&T have struggled over the form of the new rate structure and have produced a system that leaves many of the decisions regarding what kind of service will be used to customer discretion.

The FCC said that while the rates that were approved "did not constitute an ideal rate structure," the imperfections will be investigated while the rates are in effect.

The commission gave AT&T six months to align its proposed rate structure for local channels with the underlying local rates that customers could also obtain from the local telephone company to reach an AT&T central office where connection to a private-line circuit is made.

The FCC also said "questions remain about some aspects of the separate structure by which AT&T offers service on its own network" and voiced concern that "the implementation process proceeds smoothly so that alternatives provided formally in these tariff structures are actually available to customers."

AT&T's proposed discount plan for small businesses put on hold

The Federal Communications Commission suspended the May 1 start-up date for AT&T's proposed discount service for small businesses until Oct. 1, saying the carrier inadequately projected demand for the service and had not accurately estimated its competitors' pricing responses.

Called Pro-America, the discount calling plan would require customers to pay a $25 monthly fee for which they would receive a 15% discount on message telephone service — all domestic U.S. standard long-distance calls. The plan targets customers who make more than six hours of message telephone service calls monthly or spend more than $167 in long-distance calls per month.

Fierce opposition to the plan was registered by AT&T's competitors, which asserted that the dominant carrier had not filed the legally required cost support documents. The argument raised was that the service was priced below cost.

The five FCC commissioners voiced regret at the necessity for deferring the service but said that AT&T, as the dominant carrier, was legally required to show how the service would pay for itself. AT&T conceded that it would not cover its costs in 1985 but would do so in 1986.

IBM CEO predicts rebound

By Mitch Betts
CW Washington Bureau

ATLANTA — John F. Akers, in his first stockholder meeting as president and chief executive officer of IBM, predicted that shipments of IBM products will increase substantially in the second half of 1985, as Big Blue rebounds from an 18% drop in earnings in the first quarter.

The first-quarter decline, Akers said, resulted from the continuing strength of the U.S. dollar in foreign exchanges and from a slowdown in installations of high-end products as customers paused to evaluate the forthcoming IBM 3090 processors and enhanced 3380 storage devices.

Asked about the shortage of IBM Personal Computer AT units, IBM officials said they are working diligently to increase production capacity, and they predicted that shipments will double in the second quarter (over the first quarter) to meet extraordinary demand for the AT.

As a large and complex business, Akers said, IBM will continue to face several competitive challenges, such as manufacturing and marketing in high volumes, integrating its product line, operating in 125 countries and handling intense public scrutiny.

The computer giant also faces economic challenges from the U.S. budget and trade deficits, protectionist legislation and "a tax system in need of basic reform," Akers said.

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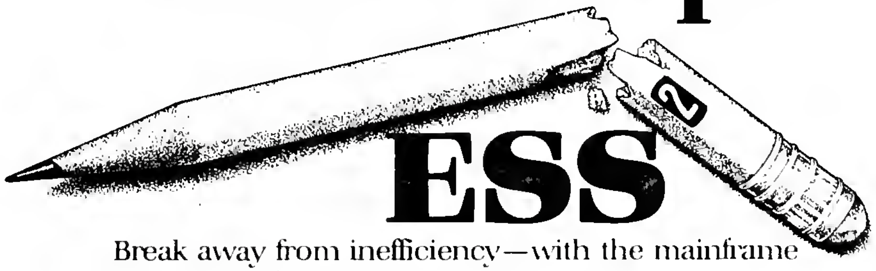

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Comdex/Spring '85 opens amid stiff micro competition

Comdex/Spring '85 may attract up to 50,000 attendees.

PHOTO COURTESY OF THE INTERFACE GROUP, INC.

Wave of IBM AT clones bow

By Eric Bender
CW Staff

ATLANTA — As the dog-eat-dog competition in microcomputer sales intensifies, computer dealers and other resellers will make their annual pilgrimage to Atlanta for Comdex/Spring '85.

Getting under way today, the show is expected to draw about 50,000 attendees, all looking for potential hits among the hundreds of microcomputer products making their debuts.

Comdex/Spring kicks off with a keynote address on the personal computer industry by Rod Canion, president of Compaq Computer Corp., and continues through Thursday. In addition to displays by more than 700 exhibitors, 42 technical and marketing sessions are scheduled.

On the show floor, the long-awaited wave of machines compatible with the IBM Personal Computer AT should be out in full flood, with Compaq's own entries sharing the limelight with systems from Corona Data Systems, Inc., Kaypro Corp., ITT Information Systems, NCR Corp., Televideo Systems, Inc., Texas Instruments, Inc., Zenith Data Systems Corp. and other vendors.

Another round of IBM-compatible laptop micros also will be on display, with recently introduced models from Grid Systems Corp., Morrow, Inc., Zenith Data and others.

Second Symphony to debut

On the software side, Lotus Development Corp. will display the second release of its Symphony multifunction package, which demonstrates the expanded-memory scheme jointly developed with Intel Corp. Lotus also will show Symphony Link micro-to-mainframe communications software, the 1-2-3 Report Writer package and the still-not-quite-ready-for-prime-time Jazz software for the Apple Computer, Inc. Macintosh.

Additionally, Microsoft Corp. will show Macintosh applications software introduced last week; Digital Research, Inc.'s Graphics Environment Manager software will be displayed at various booths; and Quarterdeck Office Systems, Inc. will unveil multitasking versions of its Desq operating environment program.

Samna Corp. will introduce word processing software supporting personal computer local-area networks and the IBM Document Content Architecture, and Innovative Software, Inc. will show a second release of its Smart Software System.

Canion

Among communications introductions at Comdex/Spring will be various packages running on the IBM PC Network. 3Com Corp. will announce Ethermac, a network server that permits Apple's Macintosh to hook up with 3Com's Etherseries products.

Digital Equipment Corp. will launch a link between IBM Personal Computers and compatibles and its Micro PDP-11 microcomputers running the A-to-Z software family. Hayes Microcomputer Products, Inc. will show Transet 1000, a multifunction device offering print and communications buffering, I/O switching and port expansion.

Digital Communications Associates, Inc. will introduce Irmalink/Windows, an addition to its micro-to-mainframe family. Several micro-to-mini products will also debut, including Quadram Corp.'s Quad 5251, an adapter card for the IBM Personal Computer that emulates IBM 5251 Model 11 and 5291 Model 2 terminals, permitting links to IBM System/34, 36 and 38 minis.

Quadram and other third-party suppliers will be showing memory boards supporting the Lotus/Intel expanded-memory specification. Enhanced graphics cards will also be in evidence. One of these, from Orchid Technology, Inc. is said to be compatible with the IBM Professional Graphics Controller and to offer 256,000 color capability.

Dozens of storage products will jostle for the spotlight, including a half-height Bernoulli Box cartridge system from Iomega Corp. and many 20M-byte hard disk drives for the IBM Personal Computer XT or Personal Computer AT.

Output devices will include a 4-lb ink-jet printer and a high-speed 136-col. ink-jet printer from Epson America, Inc.

Comdex/Spring is organized by the Interface Group, Inc., which is located at 300 First Ave., Needham, Mass. 02194.

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Martin foresees coming revolution in methodology

By Jeffry Beeler
CW West Coast Bureau

SAN FRANCISCO — A "massive revolution" will soon overtake DP methodology and promises dramatic improvements in software productivity, according to information systems guru James Martin.

After a lengthy spell of relative stability, applications development today stands on the cliff edge of a period of unprecedented technological change, Martin said during a recent conference sponsored by the Institute for Information Management.

To a degree, the predicted changes in existing methodology have already begun to materialize in the form of phenomena such as nonprocedural languages and end-user computing. Other such changes lie just over the horizon.

Of the advances that have yet to emerge, none apparently holds a greater potential for boosting software productivity than the expected advent of automated development tools for program design and specification.

For more than 25 years, the procedure for specifying and designing proposed applications has remained fundamentally unchanged. Despite enormous advances in technology, systems analysts continue to do their jobs almost entirely by hand, their chief tools being paper, pencils and plastic templates, Martin said.

Even within IBM, "software people seem to think they're in a cottage industry in which they can get away with doing things manually," he said.

In the near future, however, the face of systems analysis will be forever transformed by the emergence of high-technology aids that will allow applications design and specification to be largely automated, Martin predicted.

The tools will enable user organizations, for the first time, to apply the principles of computer-aided design to the task of creating software, he explained. In the past, the use of CAD techniques has been limited primarily to hardware, where their value has already been conclusively demonstrated, he said.

Automation of the program-design process is sorely needed. Also needed is a fundamental change in the way the system development life cycle is managed, Martin said.

Unless systems analysis and the management of development projects are significantly modernized, huge improvements in software productivity will remain elusive, he said.

With the relatively recent advent of fourth-generation languages, programming output has reportedly risen in some cases by as much as 20-fold. But the drawback with fourth-generation languages is that their benefits extend only to the coding phase of the development process, not to system design or the definition of specifications, Martin said.

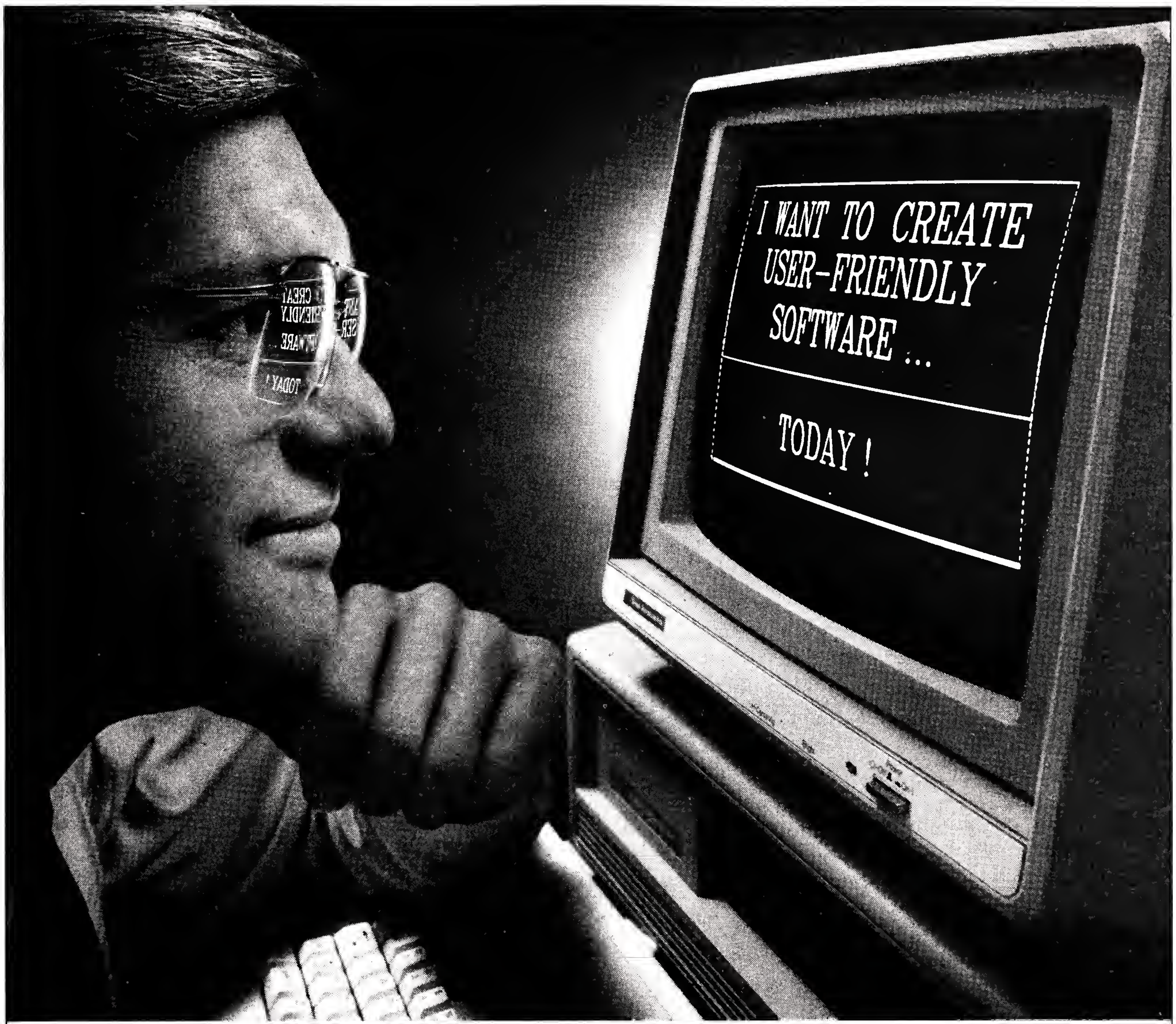
Mumps users plan meeting

CHICAGO — The 14th Annual Conference of the Massachusetts General Hospital Utility Multiprogramming System (Mumps) Users Group for professionals in medical, business, academic and scientific fields will take place June 10-14 at the McCormick Center Hotel here.

The conference will address software development, management and standards. Presentation of papers, tutorials, exhibits, roundtables and a job exchange are scheduled.

The basic registration fee is $150, plus $120 for full-day tutorials and $60 for half-day tutorials.

More information can be obtained from Mumps Users Group, Suite 510, 4321 Hartwick Road, College Park, Md. 20740.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Speaker dispels MIS spending/productivity corollary

By Jeffry Beeler
CW West Coast Bureau

SAN FRANCISCO — A Xerox Corp. executive and best-selling author last week challenged the widely held belief that information technology and high levels of management productivity go hand in hand.

Under certain circumstances, a large dose of computing resources can do a company's productivity and competitive position far more harm than good, according to Paul Strassman, a vice-president with Xerox's Systems Group.

Speaking here at the Institute for Information Management's seventh annual conference, Strassman cited recent research that uncovered "no apparent correlation between management productivity and technology spending."

Strassman conceded, however, that such pronouncements border on heresy because they conflict with the prevailing industry view that virtually any business, no matter what its condition, can profit from a massive infusion of high technology.

MIS investment hinges on health

Whether a heavy investment in MIS can truly benefit a company depends, in part, on the organization's basic state of health. If a firm enjoys a superior strategic position, spending for computing resources can yield a "handsome return on investment," Strassman said.

But if a corporation's competitive position is relatively unfavorable, a sudden profusion of systems can cut management productivity significantly. "When your business is in trouble and the big boys are kicking sand in your face, the last thing you should do is go out and buy a lot of microcomputers," Strassman said.

An ailing company wishing to return to financial good health should forget about technological quick fixes and focus instead on sharpening its strategic analysis and planning.

In other words, a troubled firm needs to identify its competitive strengths and weaknesses and then figure out how to maximize the former while minimizing the latter, Strassman said.

Rigorous physical exam

The procedure is analogous to a rigorous physical exam by a doctor and usually requires the participation of an MIS director. To succeed in today's business world, MIS executives "have to understand where the leverage factors and the added value lie in their companies," he said. "They have to understand these matters as thoroughly as they understand the details of their own departmental budgets."

Without such an understanding, Strassman added, MIS directors will be unable to decide how to invest information technology to exploit their corporations' competitive advantages.

In an interview following his prepared remarks, Strassman described MIS management as a discipline whose role is fundamentally changing. Once confined primarily to tactical and operational issues, MIS managers' professional concerns today are being broadened to include questions of how high technology should best be invested, the Xerox executive said.

Nothing in their past training or experience has adequately prepared MIS directors to assume their new-found, greatly expanded roles. The result is that most MIS executives are woefully ill-equipped to deal with questions of strategic investment, Strassman said.

Meeting the challenge

But sooner or later, they will have to meet the increased challenge. They can hardly do otherwise. "Companies can no longer afford to misapply their information technology," Strassman said. "The stakes are too high."

Strassman, who will soon leave Xerox to start his own consulting firm, could offer MIS directors no surefire formula for success in their efforts to shift from one job role to another.

"There's no magic to adding another skill to an MIS director's portfolio," he said. "MIS directors just have to spend more time with and listen to people who are already experts at investing [strategic] resources."

The change in job roles will also probably force MIS executives to delegate some of their operational duties to subordinates so that they can devote increased attention to high-level concerns, Strassman said.

Robotics industry meet set

DETROIT — The Robots 9 Exposition and Conference will be held at Cobo Hall here June 2-6. The industrial robotics conference is sponsored by Robotics International, a member of the Society of Manufacturing Engineers (SME), and the exposition is sponsored by the Robotics Industries Association.

The conference will cover the latest advances in robot technology and will feature 20 technical sessions, four forums, two tutorials and a daily course on robot basics.

Conference fees are $475 for SME members and affiliated companies and $545 for nonmembers. Individual prices for parts of the program are offered as well. Exposition fees are $10 in advance or $15 on site.

More information can be obtained from Robots 9 Public Relations, P.O. Box 930, One SME Drive, Dearborn, Mich. 48121.

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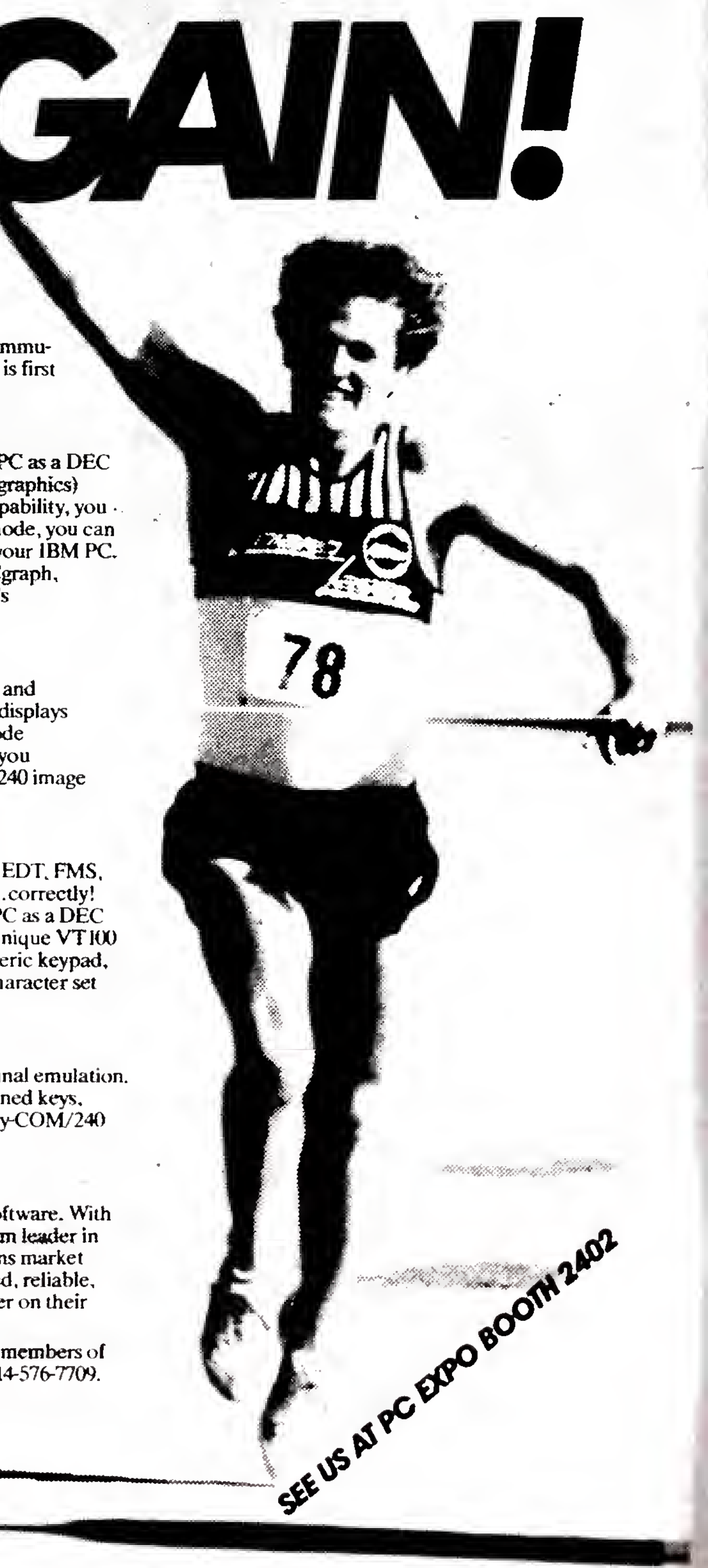
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End users gaining clout in question of micro use

By Charles Babcock
CW New York Bureau

NEW YORK — Although MIS departments have reasserted control over the acquisition of microcomputers, end users — not MIS guidelines — will dominate how the micros are used, according to a panel on "Opportunities in Personal Computing."

The panel was part of a recent two-day seminar here on the opportunities in management information, sponsored by the Conference Board, a business research group.

Speakers included Joseph T. Brophy, senior vice-president of data processing for Travelers Corp., whose workers use 9,000 micros; Michael J. McLaughlin, senior vice-president of information systems and services for New York Life Insurance Co., which has placed approximately 3,000 IBM Personal Computers on the desks of its agents; and Michael J. Intille, vice-president of information services at Central & South West Corp. (CSW), a utility conglomerate in Texas that uses 530 micros.

Intille said that his MIS department is expected to help acquire microcomputers, but the end users get control over their use. End users may select whatever brand they wish.

"That's no easy task in terms of managing my people. They say, 'Look at the dumb thing this user did.' They're upset because they can't be in charge," he said.

When CSW users want to do projects on their micros, the MIS department works with them, but the users direct the projects. An executive in the user's department must sponsor it, and it is financed out of the department's budget, Intille said.

"It's important [for] me to see a commitment from the [users]. If [they have] that commitment, [they] will stay up 16 hours a day to make it work," he said.

CSW tries to distribute a new program to its micro users each month, either one written in-house or one in the public domain. The free software encourages users to experiment, Intille continued, and it broadens their idea of what microcomputers can do.

According to Intille, his company estimated that the computers pay back their $3,000 to $6,000 cost if employees save one hour a week or 2.5% of their time a year. "They're very simple tools to cost-justify," he said.

Microcomputers are supported by a regularly published personal computer users list, a walk-in information center, a micro hot line and on-site consultation. In addition, his department supports many software packages, including Lotus Development Corp.'s 1-2-3, Cullinet Software, Inc.'s Goldengate, Ashton-Tate's Dbase III and IBM's Displaywrite 2. The microcomputer is the latest tool in advancing "the free-enterprise spirit" of his company, Intille said.

Both Brophy and McLaughlin said their MIS departments took a stricter view of cost-justifying micros, and the IBM Personal Computer XT was a de facto standard in their organizations. At Travelers, each purchase must be authorized by a central review group, Brophy added.

He said that Travelers is concerned about providing a secure environment in which micro users can operate, because many of its micros are connected to the company's 16 IBM 3084 mainframes under TSO. That tie also gives micro users access to Travelers' national network and data base management system, he said.

Travelers sells integrated financial services in a competitive environment, and microcomputers help it provide quick responses to customers, he noted. By 1990, many transactions will arrive at and leave company offices "untouched by human hands," he said.

In addition, micros are instrumental to staff changes in the company. In 1970, Travelers used two clerks for every professional, such as an account representative or an agent; by 1990, it will use two professionals for every clerk, he said.

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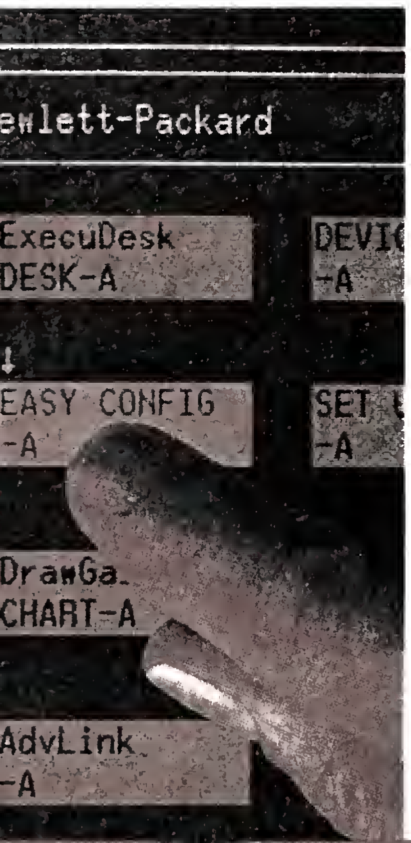

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Micro-mainframe link use varies with cluster size

By Kathleen Burton
CW West Coast Bureau

SAN FRANCISCO — The use of micro-mainframe link technology as a solution to end users' problems and as a tool allowing corporations to make realistic plans for the future is not a straightforward proposition.

So said members of a panel on micro-mainframe links at the Association of Data Processing Service Organizations, Inc. meeting here recently.

Micro-mainframe link usage depends significantly on the size of the personal computer cluster involved, according to John Worthen, president of Focus Research Systems, Inc. in West Hartford, Conn., who said his company recently completed a survey of micro-mainframe link requirements of MIS managers at 112 IBM mainframe installations throughout the U.S.

The statistics revealed that 74% of the sites surveyed had less than 25 IBM Personal Computers, and 26% had more than 100 personal computers. Of these, 80% of the users with more than 100 micros used the links to access corporate mainframe data, while only 40% of the sites with less than 100 personal computers did.

According to Worthen, 65% of all the personal computers were used in plain vanilla applications and were connected to mainframes either for terminal emulation or data transfer.

The statistics also showed that installations with less than 100 microcomputers had hard-wired local connectivity at 60% of the sites, and remote telecommunications connections at 40% of the sites, while larger sites reversed these figures, Worthen said.

This had a ripple effect on connection speeds, with small sites, which had a predominance of local loops, transferring 10% of the data at 2,400 bit/sec. or less and large sites, which had a predominance of remote telecommunications setups, transferring 28% of the data at less than 2,400 bit/sec. These figures were directly related to the local vs. remote connectivity situation, Worthen said.

Worthen also said that future micro-mainframe link usage would increase 90% during the next five years at these sites, but that users felt there were many obstacles that stood in the way of progress — data security issues, degradation of network performance and the dispersal of MIS control throughout separate corporate divisions.

Difficult to plan

Today's micro-to-mainframe links make it difficult for corporate users to plan effectively for future requirements, said David Ferris, chairman of Ferrin Corp., based here, which provides hardware and software services to micro users in Fortune 1,000 companies.

He added it will take three to five years for the technology to provide shared specialized peripherals, to let micro batch data updates into mainframes or to allow communications tools to be built into individual systems.

The major complaints from corporate users about micro-mainframe links center on the links' inability to extract only the required data, to link data relationally and to upload data easily to the mainframe data base, Joel Isaacson said.

Isaacson is president of the Personal Computer Professionals Association in Los Angeles, a service group that selects and evaluates products for corporate users. He is also chief of the Information Services Division at Carter-Hawley-Hale, a $4 billion retail organization based in Irvine, Calif.

Isaacson said that users were clamoring for microcomputer products to organize host data into standard formats for extraction, to provide standard workstation formats for transferring data and to provide user-friendly extraction programs.

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NCR unveils IBM AT clone

By Charles Babcock
CW New York Bureau

NEW YORK — NCR Corp. announced a desktop computer, said to be IBM Personal Computer AT-compatible, that will be available in August and priced 5% less than the AT's list price.

Dubbed the PC8, it will run under the NCR-DOS 3.1 operating system, capable of using software designed for the IBM Personal Computer family. It will also run Microsoft Corp.'s Xenix for a multiuser environment, company officials said.

Both the Personal Computer AT and the NCR model use the 6 MHz, 16-bit Intel Corp. 80286 microprocessor.

The PC8 will come in two models, one with 256K bytes of random-access memory (RAM) and one with 512K bytes of RAM, expandable to 4M bytes.

The basic model has a single, half-height 5¼-in. floppy disk drive with 1.2M bytes of storage.

The enhanced model has the same 1.2M bytes of floppy disk storage, along with a 20M-byte, full-height, hard disk drive, expandable to 40M bytes, company spokesmen said.

Added features

NCR claimed the micros offer additional features that add value to the IBM Personal Computer AT clone: a 640- by 400-pixel monochrome or color monitor gives higher resolution than the IBM Personal Computer monitors, but can display Personal Computer graphics; an optional 10M-byte streaming tape drive serves as a data backup device; and a keyboard with 30 programmable function keys eliminates the need to use the shift key with the function keys.

Up to 16 users may connect to the PC8 at one time, said Vernon W. Yates, general manager of NCR's personal computer division. Yates acknowledged that machine performance would slow, depending on the application being run, as more and more users hook up to the machine.

The IBM AT is limited to three users. IBM observers say the limit avoids a decrease in machine performance with disk-intensive uses such as word processing. The PC8 has the same average disk access time as the Personal Computer AT, Yates said.

The basic PC8 will sell for $3,795; the enhanced version will cost $5,505, spokesmen said. Volume shipments will begin in the third quarter.

NCR officials also announced the following:

- The PC6, an IBM Personal Computer XT-compatible based on the 16-bit, Intel 8088-2 that is said to be up to 38% faster than the XT. It will be available in July for $2,583 for a basic model that comes with a 256K bytes of RAM, expandable to 640K bytes; one 320K-byte floppy disk drive; one 20M-byte, half-height hard disk drive; and a 10M-byte tape streamer drive for backup.
- A Retail Personal Computer, combining NCR's already released PC4 with software and peripherals, including a cash drawer that allows it to function as a point-of-sale terminal. Its price ranges from $4,331 to $8,691. It is available immediately.

NCR's headquarters are located in Dayton, Ohio 45479.

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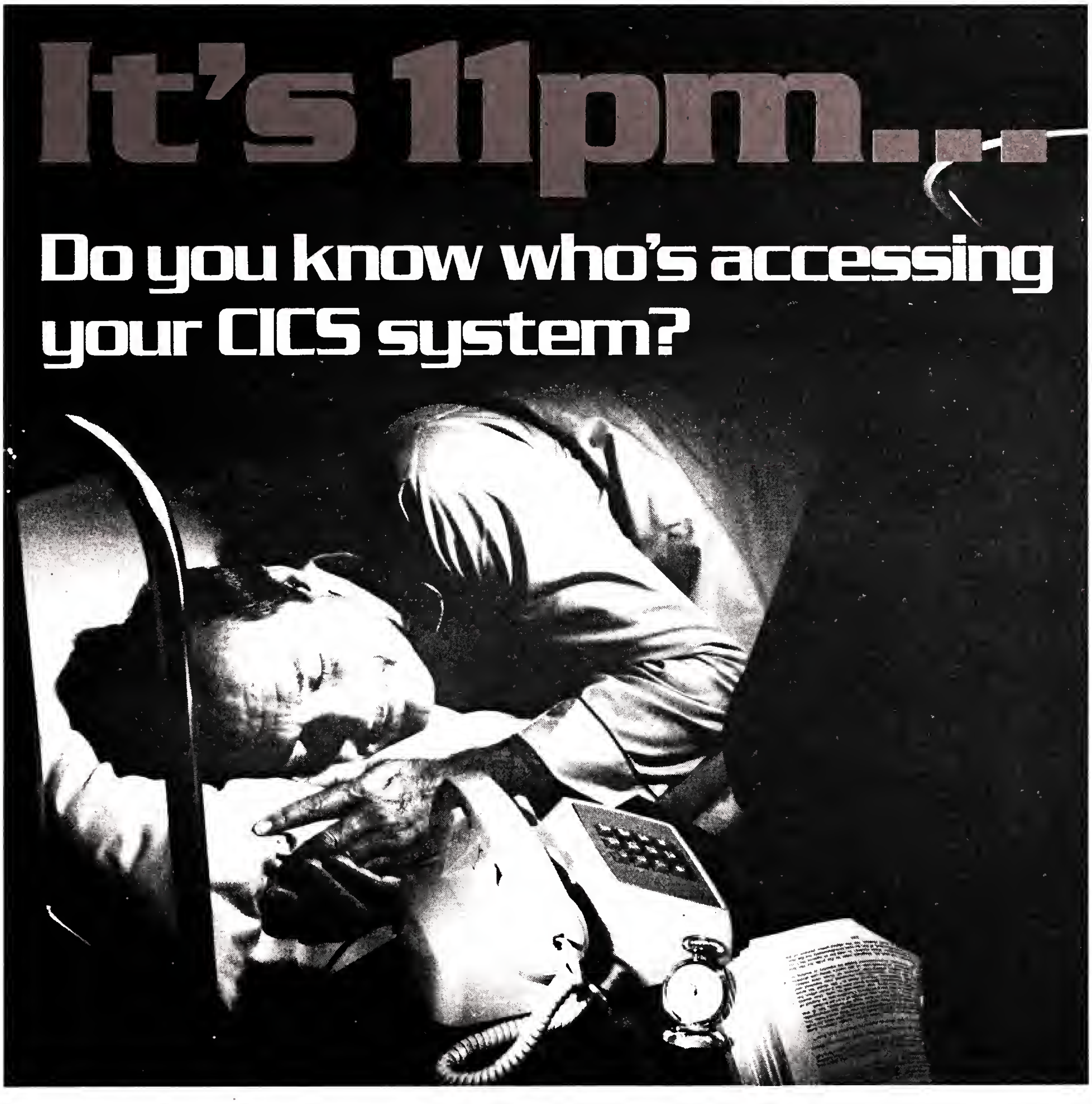
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Put DP in sync with corporate strategy, execs told

By Charles Babcock
CW New York Bureau

NEW YORK — Corporate MIS directors have to start tying information processing to the strategic goals of their companies, or someone else will assume the job, said William R. Synnott, senior vice-president of the Bank of Boston Corp.

If MIS directors succeed in doing this, they will be functioning as the chief information officers within their companies, Synnott told 75 MIS and business managers here recently. His one-day seminar, "Managing Information Resources for Competitive Advantage," was sponsored by Research & Planning, Inc., a Cambridge, Mass., consulting firm.

Synnott said the need to develop information resources that function step by step with the corporation's plan and strategy is pressing because of the danger that those people with the most knowledge of the corporation's operations may take over a high-level MIS function.

"To paraphrase Pogo, MIS managers may one day look at each other and say, 'We have met the chief information officer, and he is not us,' " Synnott said.

The first step toward assuming this role is for MIS managers and top management to share a new vision of their companies' computer resources. Top management has to see information management as instrumental to achieving the long-range competitive goals of the company. MIS managers have to acquire a grasp of the fundamental business problems facing the company, he said.

The best-known example of a business using this combined power is American Airlines, Inc.'s passenger reservation system, Synnott said. Not only did the airline's system initially favor its own flights, a practice the U.S. Department of Justice has since ruled against [CW, April 8], it also captured valuable data on the pricing and traffic patterns of competitors. By getting its terminals into travel agents' offices first, it locked out the competition, he said.

To manage change in a competitive climate, the chief information officer must become "an engine of change," encouraging the use of microcomputers throughout the company, controlling use of micros so that they can be interconnected and building networks between computer users at all levels.

Market penetration

Chief information officers should also understand that by extending their companies' services through technology, they might achieve greater market penetration and a competitive advantage, he continued.

Some banks are gaining mortgage business by putting terminals in real estate agents' offices. Realtors can prequalify a buyer at a certain price level and begin the application process if potential buyers find homes that they want. The process speeds loan approval and locks in mortgage customers almost as soon as they decide to buy, Synnott said.

When banks install automatic teller machines, they are reaching out into the consumer's space rather than building more branches. And the consumer assumes much of the information processing task formerly handled by tellers, he said.

Another way chief information officers can help their companies achieve a competitive advantage is to look for some way to use technology to generate revenue "to own the railroad," he added. Synnott cited the example of J. C. Penney Co., which, after building a national retailing network for itself, is selling time on the network to gasoline retailers for credit transactions.

Chief information officers must maintain a corporatewide point of view, Synnott said. "The question is not whether we need a chief information officer," he concluded. "The question is, 'Who is it going to be?' "

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End-user computing varies with corporate culture

By Kathleen Burton
CW West Coast Bureau

SAN FRANCISCO — Corporate perspectives toward end-user computing vary with corporate cultures, according to industry executives who direct such activities at major U.S. corporations.

Speaking at an Association of Data Processing Service Organizations, Inc. (Adapso) panel on end-user computing, held here recently, C. L. Hodges, supervisor of the Personal Computer Services Center for Chevron Corp., said his department tests and evaluates hardware and software for end users, communicates with vendors, coordinates user training and staffs a user-support hot line.

One problem at Chevron, Hodges said, is that it takes 36 days for a Chevron end user to obtain a personal computer once it is authorized, due to Chevron's lengthy approval cycle for end users. Hodges said the cycle includes reviews by Chevron's applications manager and its data communications group.

"A five-week review is an inordinately long time, especially given the short product life cycle of personal computers today," Hodges said. Chevron is in the process of cutting its review procedure down to 13 days, he said, by processing end-user orders electronically using IBM's Professional Office System and by warehousing commonly used hardware and software.

Lee Milligan, manager of financial information services at Apple Computer, Inc. in Cupertino, Calif., said that at Apple, the choice of computer hardware, software and service is left up to the end user, without the intervention of a centralized MIS department.

Rather than using an MIS department, each Apple product group decides autonomously how a computing task should be handled, Milligan said. At Apple, 50% of the computing tasks are handled by desktop personal computers, and employees are encouraged "to stay off mainframes and minis," he said.

There are problems with this autonomous approach, however, Milligan said. Information is not easily transferred between personal computers, and it is much harder to manage data.

Milligan said the benefits of allowing end users to choose their own computers far outweighs the disadvantages. Among the advantages are that there are lower computing costs and that Apple's mini and mainframe computers are freed for other tasks such as distribution, manufacturing and payroll.

Robert F. Berland, IBM's director of strategic planning for MIS in Armonk, N.Y., said today's information overload makes it difficult for end users to decide what software or networking services to use.

The most crucial requirement for end-user software at IBM is ease of use, typified by transparent data extraction and archiving, he said. The ideal end-user computing setup at IBM would leverage existing technology to link intelligent workstations, departmental micros and mainframes, Berland said.

Coby Dunn, vice-president for end-user computing at the Bank of America in San Francisco said that typical Bank of America end users have minimal computer expertise and no formal applications development training. Their requirements are largely the sharing of corporate data, integrating inquiry and analysis and generating applications development without programming, he said.

According to Dunn, Bank of America is working on a three-tiered delivery strategy for its end users, using workstations, distributed systems and mainframe computers.

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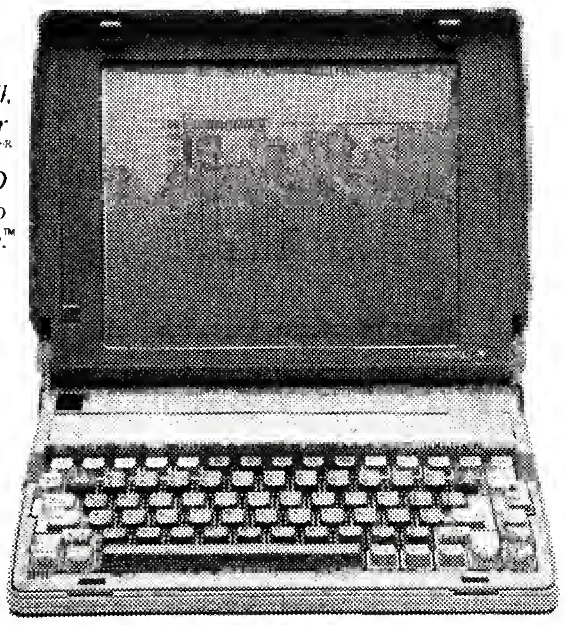

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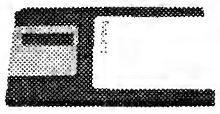

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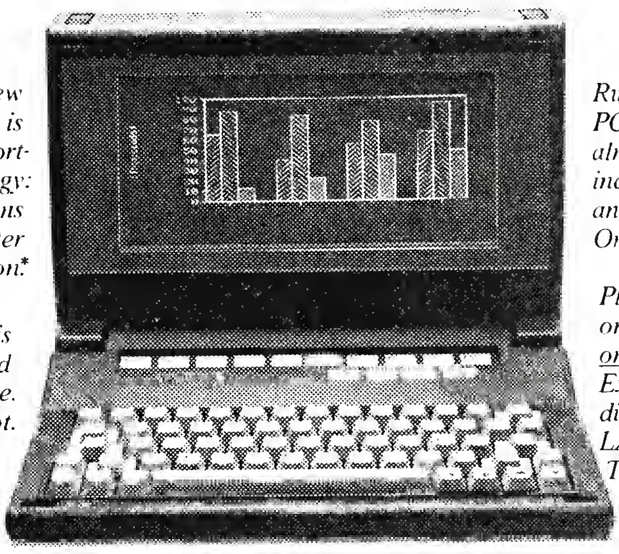

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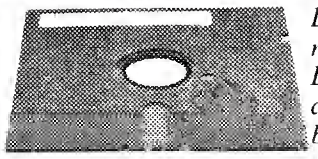

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INTERNATIONAL REPORT

CW International News Network

FRANCE

PARIS — ICL Co. has introduced the System 39 Level 30 and System 39 Level 80 mainframes, which will replace the company's 2900 line. The machines are intended to compete with Digital Equipment Corp.'s superminicomputer line and with IBM's 4361 and 3083 systems. The machines, available in single and dual versions, are based on Cmos technology and run under the VM operating system.

■

PARIS — Negotiations reportedly are under way between France's Alcatel and Altos Computer Systems, Inc. The French company is said to be interested in Altos' recently unveiled 3086 microcomputer, which reportedly is the first supermicro based on the 32-bit 68020 microprocessor from Motorola, Inc.

JAPAN

TOKYO — Japan's Agency for Cultural Affairs has announced a revised copyright law that includes software program protection. Effective Jan. 1, 1986, software will be registered and illegal to copy. To date, there has been little effort to monitor or discourage illegal use of software in Japan, and it is unclear how the new legislation will be enforced at this point.

■

TOKYO — Fujitsu Ltd. began a field trial of an integrated services digital network (ISDN) last month with an unnamed communications company in Singapore. The ISDN was designed to integrate facsimile, voice, graphics and data transmissions over a digital communications network, according to a spokesman. The field trial is intended to test multiple types of media in a single network based on CCITT standards. This reportedly requires the integration of hardware and software upgrades at three switching stations, use of digital telephone, facsimile machines, personal computers and other terminals.

■

TOKYO — NEC Corp. and NEC Toshiba Information Systems Ltd. jointly introduced the Acos System 610 mid-range mainframe and the Acos System 630 high-end mainframe. The systems feature large-scale integration and run under the Acos-4/MVP operating system. The Acos 610 is available in single- and dual-processor versions, offering 16 and 24 ports, respectively, and has memory ranging from 4M to 40M bytes. The 630 is a single-processor system with 8M to 32M bytes of main memory, 64K-byte cache memory and 24 channels, the vendor said.

■

TOKYO — Fujitsu Ltd. has added a high-end and low-end to its supercomputer line. Facom VP-400 is said to perform at 1.14G floating point operation/sec. (Flops). The entry-level Facom VP-50 reportedly operates at 140 Mflops and is field upgradable to the firm's existing VP-100 and VP-200 supercomputers.

WEST GERMANY

FRANKFURT — The West German business personal computer market grew 44% in 1984 — to 140,000 units sold — according to a study completed by Diebold Deutschland AG. The most popular personal computer in West Germany last year was IBM, with 30% market share, followed by Apple Computer, Inc., with 15%, and Olivetti Corp., with 9%. Experiencing decreases in shipments last year were Commodore Business Machines, Inc., Victor Technologies, Inc. and Hewlett-Packard Co. Personal computer sales have stagnated in West Germany without reaching the saturation point, the study concluded.

■

MUNICH — Although Systems '85: Industry Show for Computer and Communications is still six months away, Munich's biennial computer show has already booked more computer exhibitors than the World Center for Office, Data and Communications Technology segment of the Hannover Faire.

The popularity of Systems '85 appears to be growing: The show had only 962 vendors in 1983, compared with 1,400 vendors signed up for this year's Oct. 28 through Nov. 1 event (150 of which are American firms). No longer considered a regional show, Systems '85 could strip the Hannover Faire of its standing as "Queen of German computer shows," according to industry sources, because of the show's sophisticated schedule.

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German micro mart slows

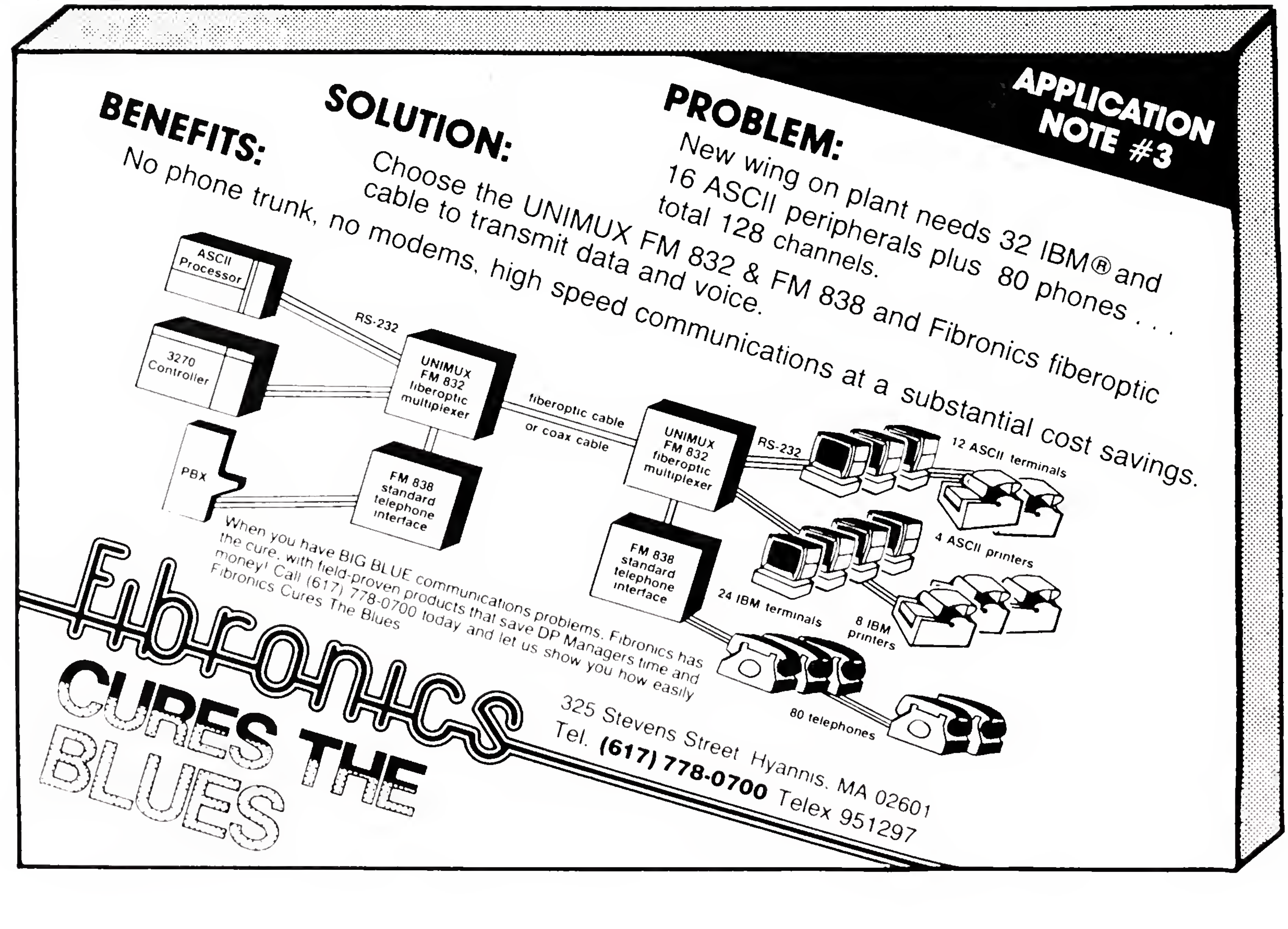
STUTTGART, West Germany — IBM Deutschland GmbH presented a "first" at a press conference here last week: its consolidated balance sheet for 1984. Along with downplaying the company's sluggish Personal Computer sales, IBM announced a modest gain in revenue for 1984, which was up just 6.2%, compared with its healthy 15.2% jump in 1983. The company's 1983 profit margin of 6.4% remained unchanged in 1984.

Last year IBM emphasized a considerable expansion of its Personal Computer business, and this year that was a favorite topic. The Personal Computer business accounted for just 1% of 1983 revenue here. One year later that figure is three times as much, said Lothar Sparberg, IBM Deutschland general manager. That means 3% of revenue, approximately $100 million, can be attributed to the Personal Computer. IBM did not mention any sales figures, but inside sources estimate that no more than 30,000 Personal Computers were sold in West Germany in 1984. These figures show a stagnation in the West German marketplace.

Diebold Deutschland AG recently released annual figures on market share in West Germany that offer another angle to IBM's position here. Based on the dollar value of installed base, the figures illustrate a decrease in IBM's market share from 28.4% to 27.5% — including micros, minis, small business systems and mainframes — to primarily benefit German competitors Nixdorf Computer AG and Siemens AG. Meanwhile, both of the latter firms enjoyed growth rates above the industry average of 15%.

According to industry sources, other West German subsidiaries of American computer vendors have lost relative market share in West Germany during 1984. These include Amdahl Corp.; Burroughs Corp.; Control Data Corp.; Datapoint Corp.; Management Assistance, Inc.; Mohawk Data Sciences Corp.; National Advanced Systems Corp.; Sperry Corp.; Storage Technology Corp.; Texas Instruments, Inc.; Wang Laboratories, Inc.; and Xerox Corp.

Among the successful American subsidiaries whose businesses all grew in West Germany last year were Commodore Business Machines, Inc.; Data General Corp.; Digital Equipment Corp.; and Hewlett-Packard Co.



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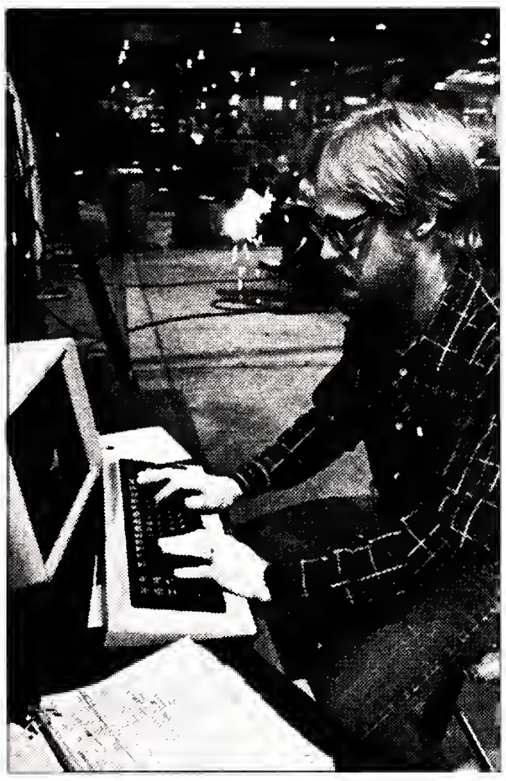
System manages savings for manufacturing firm

OKLAHOMA CITY — A manufacturing company here saved $1.5 million after it installed a system to help manage its manufacturing operations.

CMI Corp. builds controlled asphalt plants, oil field products and road construction equipment and most often builds small quantities of many products, said Larry J. Farley, manager of manufacturing systems implementation.

In mid-1982, CMI installed a Sperry Corp. 1100/61 computer with eight 8470 disk drives and 100 user terminals, Farley said. CMI bought Sperry's Unis material requirements planning system and Mapper, Sperry's report and applications development system, he added.

Sperry's Unis manufacturing software started in a pilot mode for the company's pump-unit manufacturing line in December 1983, with eight Unis modules — including inventory management, inventory accounting, bill-of-materials and order entry — and CMI's complete customer file, Farley said.



CMI's system enables Larry Jack, pumping unit manufacturing, to produce an efficiency report on a unit just completed.

Savings in purchases

The company saved about $1.5 million in raw materials purchases, labor and the carrying costs of inventory, partly because the Unis system pointed out an overstock in pumping unit subassembly component inventory, Farley said. The company was able to use up the excess components, rather than fabricate new items, he said.

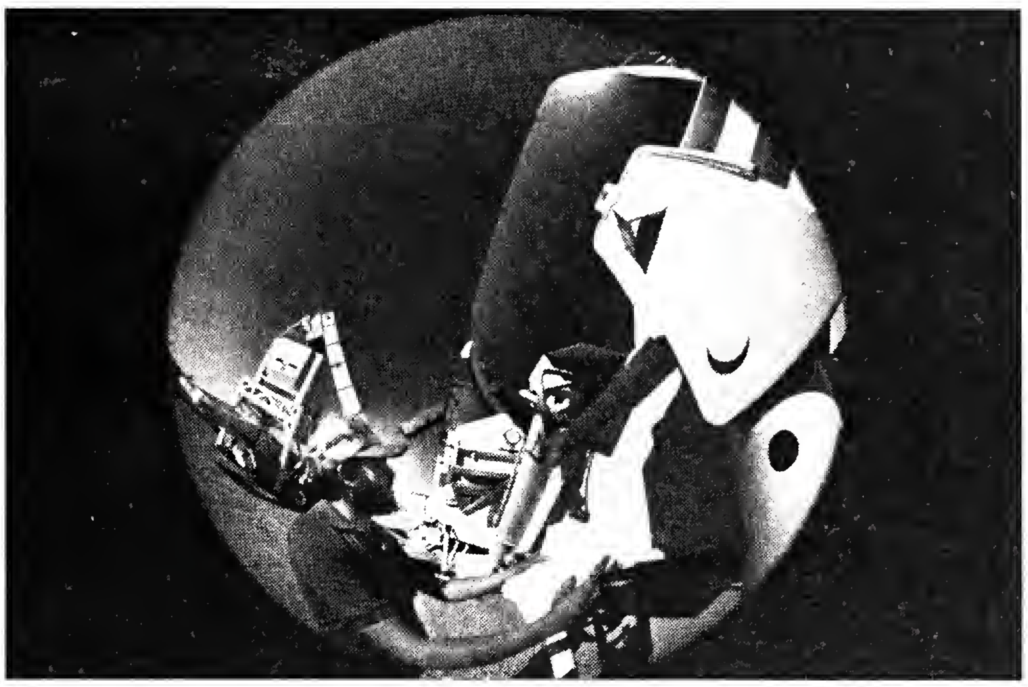
Farley found that Sperry's Mapper system, an interactive report and applications generator, lets his personnel build their own data bases and reports so they can make changes to reports quickly, he said.

The Mapper system speeds user acceptance of the Unis manufacturing and resource management system, Farley said. Mapper is unable to access the data base, but can pass a request to a Cobol program to pull the data from Unis out into Mapper so the user can manipulate it, he said.

There are now more than 200 Mapper system users with more than 400 applications at CMI, Farley said. Typically, a user will put together two or three different reports, each taking about five minutes, then enter the necessary data and start manipulating or doing calculations with it, he said. If the user needs help, Farley or others can assist him, he added.

The company saves 12 to 16 man-days per month by using Mapper to prepare spreadsheet reports that formerly were calculated and typed, explained Mapper coordinator Richard

See **CMI** page 30



CMI production planner Ed Bergen checks a shipping manifest.

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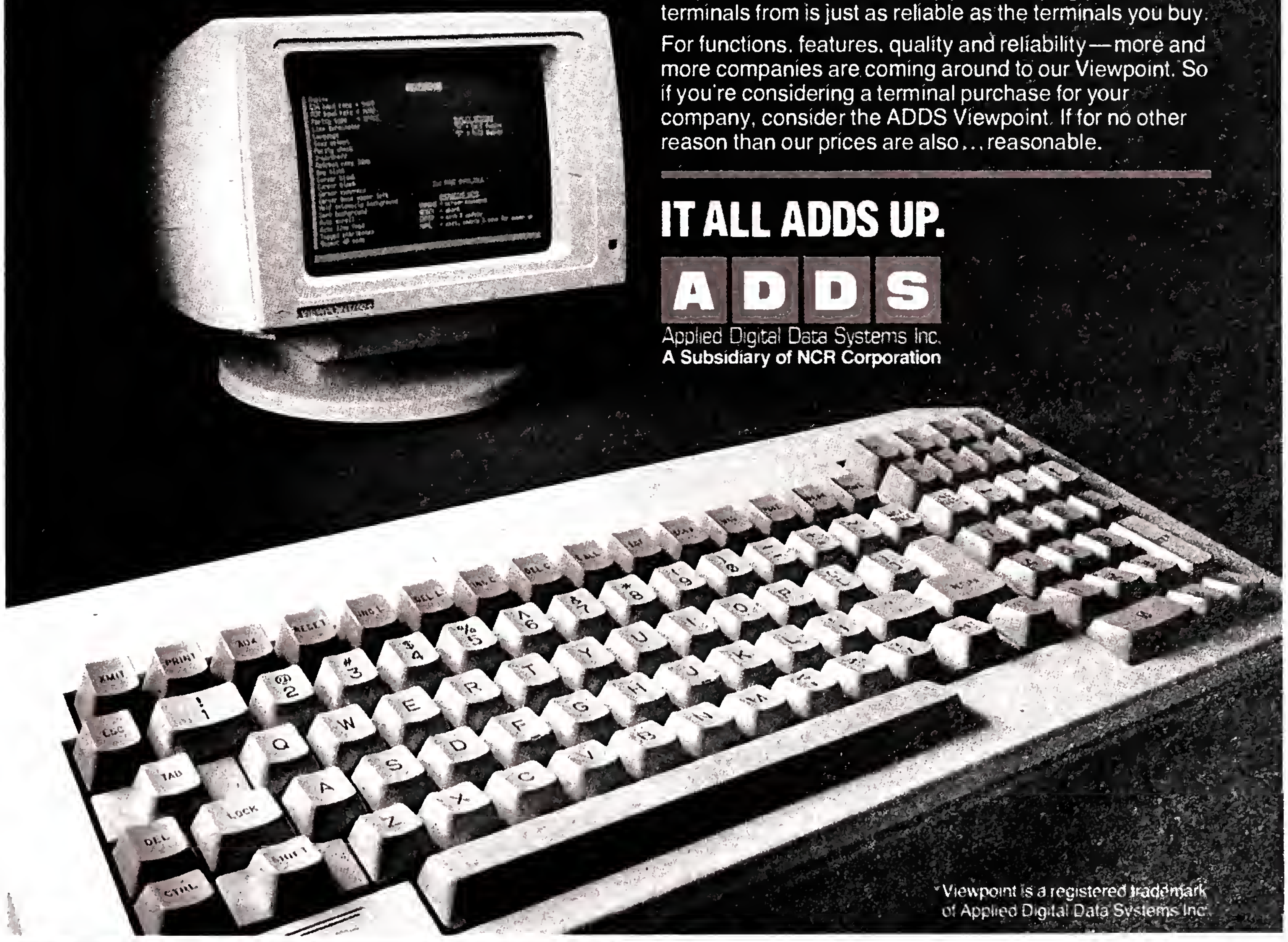

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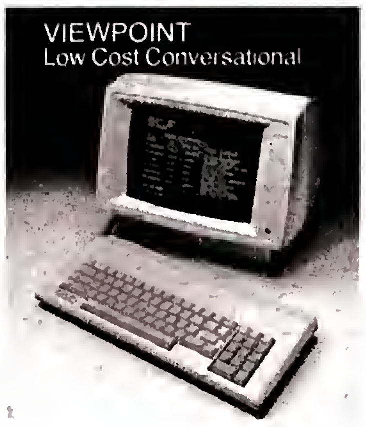

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CMI's management system streamlines data.

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from page 29

Wooton. In the past, two monthly comparisons of product costs for upper management and sales each took three to four days to prepare, Wooton said. Now, producing four of the reports takes a total of two hours.

About 2½ hours per week are required to enter and analyze time-card data — a task that previously took 20 man-hours per week, he said.

A production control supervisor who is a beginning Mapper system user recently spent 30 minutes putting together a six-month forecast on after-market sales of approximately 1,100 manufactured parts, Farley said. His manager wanted information about the quantity on order and the quantity on hand added to the report, and Farley added the extra information in about five minutes, he said. Then, top management saw the report and asked that unit costs and extended cost data be added too. It went back to Farley for another five minutes of work, and the result is a document now valuable at several levels, he said.

Some of the marketing staff at CMI changed their minds about getting their own microcomputers because they discovered the information they wanted was available through the system, Farley said. He added that extensive quality-control reporting and auditing is now on the system, too. It serves to keep track of parts audited, reject information and the responsible department, he said.

CMI is extracting parts description and cost data from almost every Mapper system application, Farley said. This eliminates an operator having to key in the information, and it also automates the costing of almost any parts report when management wants cost data, he said.

The Mapper application that most CMI people come in contact with is a combined production/service parts shortage report that includes expediting information, due dates and promised dates and other information by department and manager so the manager knows just what machine has been held up, Farley said. This comes out each morning, or more often if necessary, in about 20 copies, which are not identical, according to Farley.

DPMA to offer May seminars

PHILADELPHIA — The Data Processing Management Association (DPMA) here will host three morning seminars at the Sheraton University City hotel here during May.

The topic on May 15 is "Decision Support Systems and the Office of the Future"; on May 22, the theme is "Micro-to-Mainframe Linking Within the Information Center"; and on May 29, the seminar theme will be "Application Development Tools."

The sessions cost $40 each for members and $50 each for nonmembers.

More information is available from the DPMA of Philadelphia, P.O. Box 2357, Philadelphia, Pa. 19103.

IBM announces grant recipients

ARMONK, N.Y. — IBM has donated $27 million worth of cash and equipment that will be shared among 13 universities for programs to enhance graduate-level MIS education.

The grants are designed to help graduate schools prepare students to manage data bases, DP equipment and software, IBM said. With the grants, universities can improve curricula and develop courses leading to advanced MIS-related degrees. Each school will receive up to $1 million in cash and up to $1 million worth of IBM hardware and software.

The 13 universities were selected from 77 schools that submitted proposals in response to IBM's announcement of the grant program in April 1984.

The universities include the Claremont (Calif.) Graduate School, Georgia State University, Indiana University, MIT, the University of Arizona, the University of California at Los Angeles, the University of Georgia, the University of Illinois at Urbana-Champaign, the University of Minnesota, the University of Pennsylvania, the University of Pittsburgh (Pa.), the University of Rochester (N.Y.) and the University of Texas at Austin.

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Q A TURNAROUND TIME

Larry Long

Q While I have some sympathy for the difficulties encountered by personal computer software vendors protecting their proprietary interests, their stipulations on copying are impractical in a corporate environment. The current public relations campaign to get the public to conform to licensing protocols leads me to wonder whether our current practices are ethical.

We would never knowingly cheat or defraud anyone. However, our own procedures for distributing personal computer software within our own organization do not conform to the many and varied forms of words that software vendors wrap around their licenses.

We buy licenses for every personal computer that runs licensed software, but we try to avoid buying licenses when we just want to evaluate a package. Borrowed software is returned following evaluation and back-up copies are destroyed.

We issue copies, not the original software, to our production users — and we won't license anything we can't copy.

We don't reregister licensed software if it is moved to a different host personal computer or when we swap the original personal computer for repair or upgrade.

These practices clearly do not conform to the requirements of many of the software licenses. Even though our practices are not intrinsically illegal, they could be regarded as being in breach of contract. However, we don't consider that we have damaged the interests of the vendors, so any breach would be merely technical and have no financial value.

Our procedures are based on commercial pragmatism. Because of this, we do sign licenses that we don't intend to adhere to fully. Is this practice ethical?

A breach of contract, no matter how seemingly insignificant the infraction, is unlawful and, therefore, it is unethical.

It's common knowledge that people in business, government and education have abused personal computer software license agreements — some blatantly. People have openly recounted their abuses to me with a sense of pride of accomplishment. In reprisal for these abuses, some software vendors may have overreacted, in my opinion, in the stipulations and restrictions they set forth in their license agreements. I would be surprised if one out of 100 users even reads the agreement. Most simply use common sense in their treatment of a vendor's copyright.

The vendor-sponsored campaign to curb abuses is needed, but I agree with you that we need a more pragmatic approach to the licensing of proprietary software. I would encourage the personal computer software industry to cooperate in developing a universal license agreement that is guided by common sense and fairness, and that can be understood by all and enforced by the industry. As is, a great many users are feeling pretty unethical about now.

Q How do you gracefully say that I will do any work that is remotely related to computers? I have 23 years experience in operations, programming and systems. And I've been unemployed for eight months.

On my resume, I stated that I am seeking "a challenging position as a programmer/analyst leading to project management." How can I say that I would be happy with any type of computer work without sounding like I'm desperate?

How about this: "a challenging opportunity that will permit me to employ my computer expertise in areas where computing and information resources are not realizing their full potentials."

Long, president of Long and Associates, is a consultant, lecturer and author in the field of information services. If you have a question you'd like him to address, send it to Larry Long, Editorial Department, Computerworld, *P.O. Box 880, Framingham, Mass. 01701.*

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CALENDAR

WEEK OF JUNE 2

JUNE 2-5, DALLAS — **American Bankers Association's 1985 National Operations and Automation Conference.** Contact: American Bankers Association, Communications Group, 1120 Connecticut Ave. N.W., Washington, D.C. 20036.

JUNE 3-4, BOSTON — **Fundamentals of Data Processing for Administrative Assistants and Secretaries.** Contact: New York University School of Continuing Education, 575 Madison Ave., New York, N.Y. 10022. Also being held June 20-21 in San Francisco and June 27-28 in Los Angeles.

JUNE 3-5, MONTREAL — **Canadian Information Processing Society Congress '85.** Contact: Canadian Information Processing Society, Fifth Floor, 243 College St., Toronto, Ont. M5T 2Y1 Canada.

JUNE 3-5, SAN FRANCISCO — **Long-Range Information Systems Planning.** Contact: American Management Associations, 135 W. 50th St., New York, N.Y. 10020. Also being held June 17-19 in Boston.

JUNE 3-6, CHICAGO — **IMS/DB (DL/1) Application Programming.** Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 24-27 in Washington, D.C.

JUNE 3-6, CHICAGO — **Vtam: From Start to Finish.** Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 17-20 in Boston and Atlanta and June 24-27 in Los Angeles.

JUNE 3-6, FORT LEE, N.J. — **CICS/VS MRO/ISC.** Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 3-6 in Los Angeles, June 17-20 in San Antonio and June 24-27 in Fort Lee.

JUNE 3-6, DENVER — **Vsam: Its Structure and How to Use It.** Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 10-13 in Fort Lee and June 24-27 in San Antonio.

JUNE 3-6, LOS ANGELES — **CICS/VS Logic and Debugging.** Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held on June 17-20 in Fort Lee and June 24-27 in Atlanta.

JUNE 3-6, NEW YORK — **IMS/DC Programming.** Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 17-20 in Chicago.

JUNE 3-6, WASHINGTON, D.C. — **CICS/VS Applications Design.** Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 11, 13, 18 and 20 in New York; June 17-20 in Fort Lee and Los Angeles; and June 24-27 in San Antonio.

JUNE 3-5, MONTREAL — **Montreal International Software Market '85.** Contact: Montreal International Software Market, P.O. Box 1119, Suite 1919, 300 Leo-Pariseau, Place du Parc, Montreal, Que. H2W 2P4 Canada.

JUNE 3-7, FORT LEE, N.J. — **CICS/VS Internals.** Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 10-14 in Atlanta, June 17-21 in San Antonio and June 24-28 in New York, Chicago and Los Angeles.

JUNE 3-7, ATLANTA — **CICS/VS Application Programming — Command-Level.** Contact: On-Line Software International, Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held June 10-14 in Boston, Chicago and Los Angeles and June 24-28 in Fort Lee and San Antonio.

JUNE 3-7, MONTREAL — **Fourth-Generation Languages: Paths to Productivity.** Contact: National Seminar, Canadian Information Processing Society, Fifth Floor, 243 College St., Toronto, Ont. M5T 2Y1 Canada.

JUNE 3-7, BOSTON — **Systems Workshop II.** Contact: Ware Associates, P.O. Box 948, Groton, Conn. 06340.

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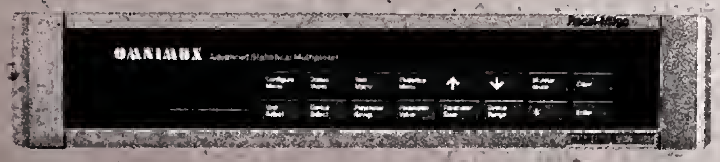

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EDITORIAL

Can we talk?

Is it just saber rattling, or is there a pitched battle brewing between users and vendors over the software protection issue?

On one side are the micro software vendors. Their rightful claim to losing millions of dollars a year to illegal copying of their packages has prompted them to promote a protection methodology based on locks and "key rings."

On the other side is the most outspoken of perhaps a dozen corporate microcomputer user organizations: the New York-based Microcomputer Managers Association. The group's no-nonsense, blanket rejection of the Association of Data Processing Service Organizations, Inc.'s proposed lock-and-key scheme [CW, March 11] caught the micro software vendors off guard and appears to have set the stage for a classic user-vendor confrontation.

Vendor reaction to the users, gauged at the recent Adapso spring meeting, indicates little softening in the industry's position. No matter whose estimates of revenue loss to piracy one believes, it is clear that copying the leading micro software packages is a growing threat as end-user computing proliferates.

Users are determined to protect their investments and their future revenue stream by promoting site licensing, the only antipiracy methodology they can accept at present. However, site licensing — whereby users pay a flat fee for limited or unlimited copies of a package — is not a palatable choice for many vendors, as it, too, would cut into the revenue derived from unit-priced sales.

But certainly no protection methodology can be effective without widespread corporate acceptance, and that is precisely what the MMA claims is missing here. Its concerns are as valid (and different) as those of the vendors: the key scheme does not address the growing number of multiuser systems; some workers could find themselves carrying several different keys or buying duplicate keys for each micro they use; lock installation would be a costly headache.

It is unclear just how seriously each side is taking the other in the software protection matter. Some Adapso members seem to regard the MMA and its protest as little more than a nuisance, although the official line from the organization is one of concern.

The MMA, on the other hand, has made little effort to date to talk the matter out with Adapso. The MMA was not formally represented at the Adapso meeting, which dozens of micro software vendors attended and where the protection issue was discussed in open session. The MMA claimed it wanted to be in on protection discussions from the outset but was not invited to do so.

Initiating open and continuous dialogue between users and vendors before a full-scale war breaks out would be in the best interest of both sides. The MMA has threatened to use its multimillion-dollar buying clout as leverage to counter unwanted protection schemes. Adapso knows that its membership holds the keys to business solutions and that the MMA has nowhere else to go for pivotal micro packages and peripherals.

Clearly, one side must draw a line over which the other can jump and begin thinking about compromises.

'Don't complain. Two drops in the bucket are certainly better than one.'

LETTER

Make Cobol code understandable

And the absurdity goes on. Articles such as "Maintenance push is on" [CW, April 8] are prime examples. This article supposedly deals with Cobol productivity in general and program maintenance in particular. Yet not once in the entire article was the major reason for the lack of program productivity mentioned.

How long and what will it take for us to recognize that the ability to understand Cobol coding has a direct correlation to programming productivity?

The author described 30 bugs/1,000 source code statements for new programs, but he said that adding new code is a much more hazardous undertaking. Doesn't the author recognize the danger is simple — that the code to be modified is not clearly understandable? Doesn't he realize that much fewer bugs will be created modifying 5,000 lines of clearly understandable code than 500 lines of poorly programmed code? The fact that the author is still using "lines of code produced" as a measure of productivity is very discouraging. How can the author and others discuss poor Cobol program productivity without identifying the major reason for it?

Structured code can isolate each function of a program in a top-down format. That is all it does. Although that is very desirable, it does not make Cobol coding more understandable.

This type of coding is just as difficult to understand — whether it's within structured or spaghetti code. The author obviously is not aware that many installations have found little or no im-

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VIEWPOINT

Collaboration benefits management, vendors

THE DATA CENTER
John P. Murray

There is a great deal of difference in the way the managements of installations work with their vendors. The styles range from total reliance upon the vendor to complete independence. These cases represent the extremes, and neither is correct.

In the first case, the installation's management has abrogated its responsibility. You can find examples of organizations under the de facto control of their vendors. In these situations, no solution, other than the particular vendor's solution, is even considered. This is unfortunate, of course, because it precludes all opportunities to find more appropriate, and perhaps less expensive, solutions. Sometimes, as a result of this one-vendor policy, an unnecessarily complex or cumbersome approach is taken to solve technical problems because those are the only answers available from the vendor.

The second instance is also representative of an incorrect position with regard to the vendor-customer relationship. There are information processing managers who absolutely will not rely upon their vendors for anything other than support for whatever specific products they may have installed. The "don't call us, we'll call you" syndrome is in effect here. Sometimes you will see examples of outright hostility toward particular vendors. That is an unfortunate circumstance; it does no one any good.

There is a middle ground. Development of an environment where the management of the installation and its vendors work together should be encouraged — a collaboration seeking to improve the information processing function. The goal should be the development of a first-class installation, where both the customer and the vendors secure benefits.

The vendor is often in a position to provide significant help beyond the installation and continuing maintenance of its products. The knowledge the vendor acquires as a result of its experience in a variety of situations can be most beneficial where an appropriate rapport has been developed between the vendor and the installation's management. Astute managers should recognize this potential assistance as a positive factor, and they should work to cultivate the proper relationship.

> ”
>
> *The goal should be the development of a first-class installation, where both the customer and the vendors secure benefits.*

First set the ground rules

The primary step in the development of such a relationship must be in the establishment of the ground rules. The management of the information processing department must not relinquish its authority. The proper role of the vendor is to support actively the needs of the installation within the guidelines set forth by the function's management. The atmosphere should not only allow but encourage the vendors to suggest new approaches, new products, and these suggestions should receive serious consideration from the customer. It must not be forgotten, however, that the ultimate goal of the vendor is to increase sales.

Conversely, once an installation's management has rejected a particular item or suggestion, the vendor must acknowledge that the issue is closed and move on to other things. Some vendors do themselves considerable harm because they are unwilling to accept that an issue is closed. Going to a higher level in the organization to plead a case may generate some additional sales, but such a tactic may work against the vendor and create considerable ill will in the long run.

The usual result of such a vendor strategy is the development of an adversary relationship with the installation's management. This contributes to an attitude that works to exclude the vendor from increased participation — and eventual increased sales — within the organization.

Both customer and vendor should be aware of the value of ancillary services the vendor can provide. This can often be provided with little or no cost to the customer. This aspect of dealing with the vendors should be considered a value-added feature. Vendors should work harder to push this concept because it is of value to all concerned. Making the management of the particular installation more effective without increased cost will often generate increased sales for the vendor in the future.

Applying value-added features

What are some of the specific areas where help can be provided? Several concerns within the data center can be used as examples. Many data centers face difficulty in dealing with change control, with their scheduling processes and with client relationships. As a result of their numerous contacts, vendors are often aware of data centers where these concerns are being effectively managed.

The vendors may be able to supply the names of people in other organizations who can provide help. They may also be able to provide members of

See **DEAL** page 39

Murray is director of management information services for Rayovac Corp., Madison, Wis., and author of Management Information Systems as a Corporate Resource, *published by Dow Jones-Irwin.*

A 'we'll see' approach can placate cries for new 'toys'

MANAGEMENT MATRIX
Walter F. Cuirle

Let's suppose that you are handling DP for one of several divisions within a big corporation. You get a call one day from the vice-president, asking you to "come over for some coffee and a chat." The next day, there you are with your boss and maybe one or two people from other areas for a little coffee and a chat about, as it turns out, shiny new toys.

The vice-president just returned from a tour of another division and is bursting with new ideas — some of which involve you. "They have this great new XYZ system they just finished, and the vice-president over there tells me it shouldn't be too much trouble to implement here. It ought to be a big help to you in finishing up that ABC system of ours. What do you think?"

Forget the report you did last week describing ABC as 65% complete. Stay calm. Remember what you were told as a kid when you absolutely *had to have* a shiny new toy just like the other kids. Don't say no; say, "We'll see."

There must be a reason why the powers that be want this thing. There must be a reason, whether or not it's a good one. This means you really do have to take a good look at this new toy. If you decide not to adopt the system, you'll need solid reasons for the front office. If you do decide to adopt it, the reasons must be even more solid for the folks in the programming pit. (They do get a little possessive about their creations.)

Time is a problem

Your problem is one of time. Ordinarily, you would want to work up a point-by-point comparison of the existing and proposed systems: strengths, weaknesses, costs and savings. This lets everyone involved make an objective choice. But the kids in the front office are no doubt eager to get your answer; you don't have the time to do that full study, and the odds are you don't have the budget to support it either. The trick is to do just enough of an analysis to let the folks in the front office decide whether or not they want to fund your department for a full study. Don't consider this just another batch of busywork — look at it as an opportunity to close a sale.

You're selling that full study, and the nice thing is you win no matter what. If they buy the study, you have the time and money to do a proper analysis of the new XYZ vs. your existing ABC. On the other hand, your presentation may show that abandoning ABC for XYZ is just too expensive. You won't have wasted time on an unfunded study, and you wind up no worse off than you were before.

Recognize that the attraction of this new toy is likely to be more in how it looks and what it does than in how well it performs what it promises. Your presentation should reflect that attitude, comparing features and the costs. To do that, you can successfully use some of the techniques used to close a sale.

Add up the features

One technique that fits the situation and takes a little time is called the "T Close." Draw a large "T" on a piece of paper, dividing it into two columns. Label one side "XYZ," and put down its notable features, starting with the ones that seem to be attracting the most attention. Label the other column "ABC," and opposite each of those desired features put down the nearest equivalent feature of ABC. If your ABC system doesn't have it, put down the name of your in-house package that does. You should be able to sketch this out fairly rapidly in a brief talk with the people who want the new system. You can fine-tune it with a telephone call to the DP manager who uses the other system. Finish by extending the ABC column, if necessary, with those features it has that XYZ doesn't.

You'll see two things from the columns: a list of current in-house systems that have the desired features and a set of those features that you do have that the XYZ system doesn't provide. It's almost certain that the desired features can't be carried over directly, but because you have identified the nearest equivalent, you can find a reasonable estimate of the cost to produce that feature just by looking in your files. If you completely adopt the new system, you will have to rework it to add those features or you'll lose them. That's an expense, too.

You'll end up with three numbers: the cost to abandon ABC and adopt XYZ, the cost to modify ABC to pick up the most attractive features of XYZ and the cost to adopt XYZ and

See **MATRIX** page 39

Cuirle is a senior associate with Nicholas DeMaio Associates in Bryn Mawr, Pa.

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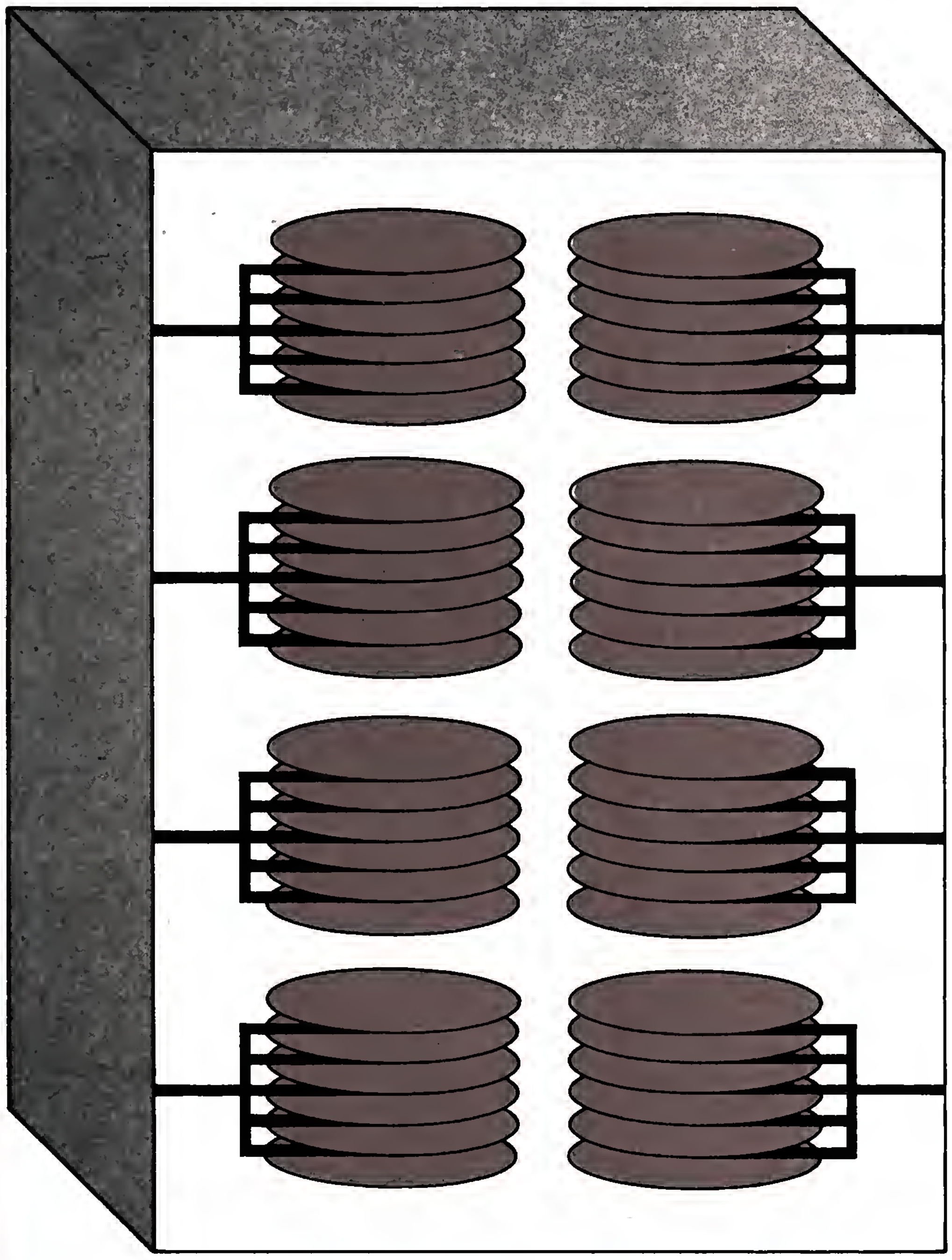

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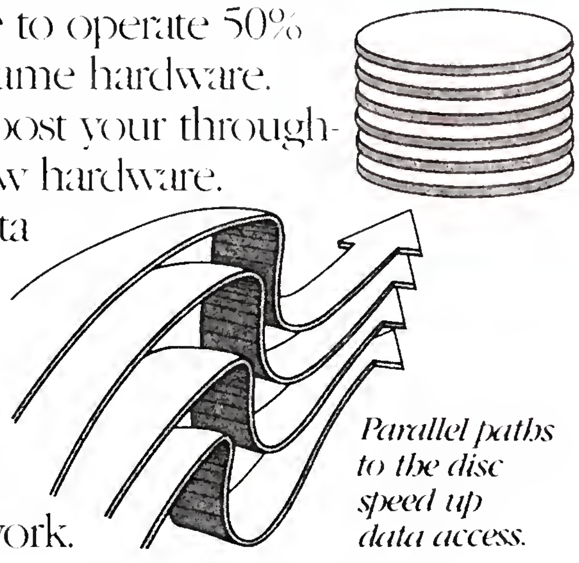

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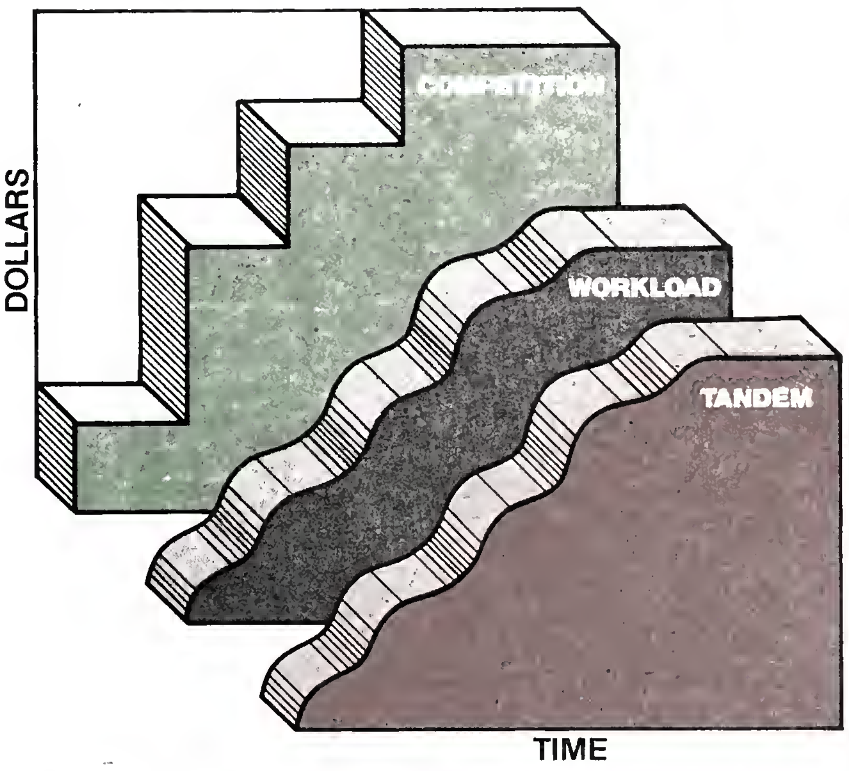

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TANDEMCOMPUTERS

IBM 3270 no substitute for 5250 on System/36, 38

READER'S PLATFORM
Charles S. Balsly

The proliferation of IBM products based on the 3270 technology has been the subject of much attention, particularly in the article, "Evolution of the IBM 3270" [CW, Jan. 21], where author Scott Brear presented a number of comments and reflections on the subject. I am in agreement with most of those comments, but there is one area in which my opinions differ — namely, the possibility that IBM will standardize the 3270 as a replacement for the 5250 series supported on the IBM System/36 and 38.

This projection was based on the release of remote 3270 support on the System/38, as well as on the fact that a version of the 3180 terminal is supported locally on both the System/36 and 38. On the surface, these two facts would tend to support the anticipation of 3270 standardization. However, detailed examination of these facts may lead one to an entirely different set of conclusions.

Although the 3270 and 5250 terminal series appear to be functionally similar, the 5250 series has a number of features designed to relieve the host or remote cluster controller of many of the processing functions required in the 3270 series. The 5250 series — 5251, 5291, 5292 and 3180 Model 2 — have 32 different combinations of display attributes supported on a standard basis. The local editing features include independent processing of zero fill, right/left adjust, auto field exit and alphanumeric field-only check.

Resident logic

A key point is that the logic to support these features is resident in the terminal itself, rather than in the controller or the host applications program as in the 3270 series.

It is true that IBM has released support of remote 3270 clusters on the System/38, but I suspect that this feature was announced to assist migration of small networks — for small 4300 series customers who have chosen to move to the System/38 environment — rather than as an indication of the 3270 becoming the primary terminal for this system.

The support of 3270 devices on the System/38 requires large memory commitments (60K-byte base plus 20K byte/device) and significant system overhead to allow the 3270 to emulate the functions of the 5250 keystrokes. If IBM had intended to position the 3270 as its replacement for the 5250 on the System/38, one would have suspected IBM to have taken a more integrated approach to 3270 support.

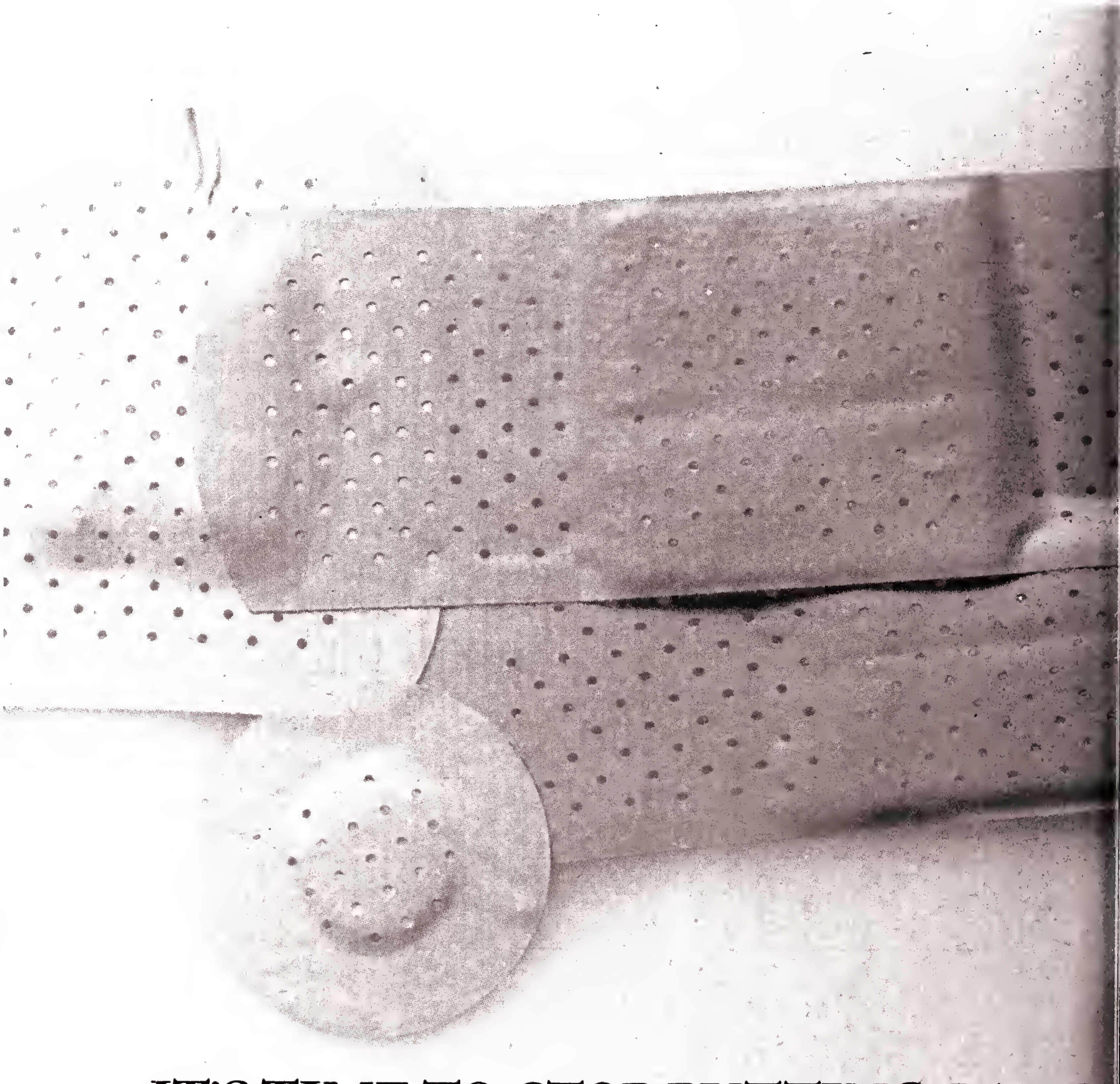
IBM further supports evidence of my position by its introduction of the 5294 remote cluster as a replacement for the 5251 Model 12 remote cluster. The 5294 has enhanced processing capabilities that can be modified by microcode changes. The new unit can support speeds up to 56K bit/sec. The unit has vastly increased local storage, which reduces the amount of data traffic between the host and the cluster significantly by providing local screen save and restore capabilities.

Several clues to IBM's future directions in these areas were provided recently by IBM's comprehensive announcement of its Office Automation Strategy. The 5294 has been enhanced by the addition of a text editing assist feature to work with the new Displaywrite series announced on the System/36 and indicated as a future product for the System/38 in an IBM statement of direction.

The second point raised by

See **3270** page 39

Balsly is president of Perle GSD, Ltd., a Chicago-based supplier of protocol conversion equipment for the IBM System 34, 36 and 38.



IT'S TIME TO STOP PUTTING BAND

Without doubt, the proliferation of personal computers throughout your organization has done much to increase personal productivity within departments.

But it has also given rise to an increasing – and alarming – decentralization of information, much of which is vital to the whole organization.

The answer, of course, is networking – tying together groups of PCs on a system that allows them to communicate with others.

Unfortunately, however, most currently available networking solutions address only part of the problem. Sure, they tie compatible PCs together within departments. But can they communicate with similar networks in other departments?

And where does that leave the information needs of the company as a whole? What about communications between non-compatible PCs, LANs, host minicomputers and mainframes?

What is really needed is a solution that addresses *all* of your networking problems. A solution like Banyan's Virtual Networking System.

Unlike LANs and other partial solutions to the problem, Banyan approaches networking from the standpoint of distributed computing, where one or more LANs must be supported within departments, between departments, between buildings or even in other cities.

LETTER

from page 34

provement in program productivity while using structured coding. This is because no attention was given to improving the ability to understand Cobol coding. Installations that have shown some increase in productivity included walk-throughs. These walk-throughs encourage programmers to make their coding more understandable in anticipation of the walk-through sessions. It is this coding clarity, combined with the structured coding, that is making the difference.

We in data processing seem to forget that programming productivity — through clearly understandable, easily modifiable coding — was the major objective of the creators of Cobol. All we need to do is use Cobol as they intended.

A key tool to achieving understandable coding is the automated Cobol quality assurance monitor. It examines Cobol coding and alerts programmers and management to deviations from company standards. It also includes a metrics portion that identifies the quality of software and applications programs.

Data processing can dramatically increase program productivity once it recognizes that understandable coding is the correct path and then follows that route.

Jerry Sitner
New York

DEAL

from page 35

their own staffs who can suggest methods that have worked well for other installations. Rather than continue to struggle with such issues, the help of the vendors should be solicited.

The vendors can, as another example, organize tours of other installations for senior management who desire increased information about a new process or system before they agree to provide support for its installation. To some degree, of course, this is a sales ploy, but it can also provide an opportunity to demonstrate how the process or system might work in the organization. It also gives senior management the opportunity to look objectively at the value of the proposal.

A balance must be struck between turning over control of the information processing function to the vendors and ignoring the potential inherent in their increased participation. If the value of that participation is understood and appreciated, if management works to develop the appropriate environment and if the proper balance is maintained, everyone in the installation wins.

MATRIX

from page 35

modify it to pick up the most attractive features of ABC. Obviously, you can't guarantee that the work can be done for those costs — the numbers are too rough as yet. On the other hand, you can justify each of the numbers as reasonable, even if rough, because they come from previous projects rather than off the top of your head.

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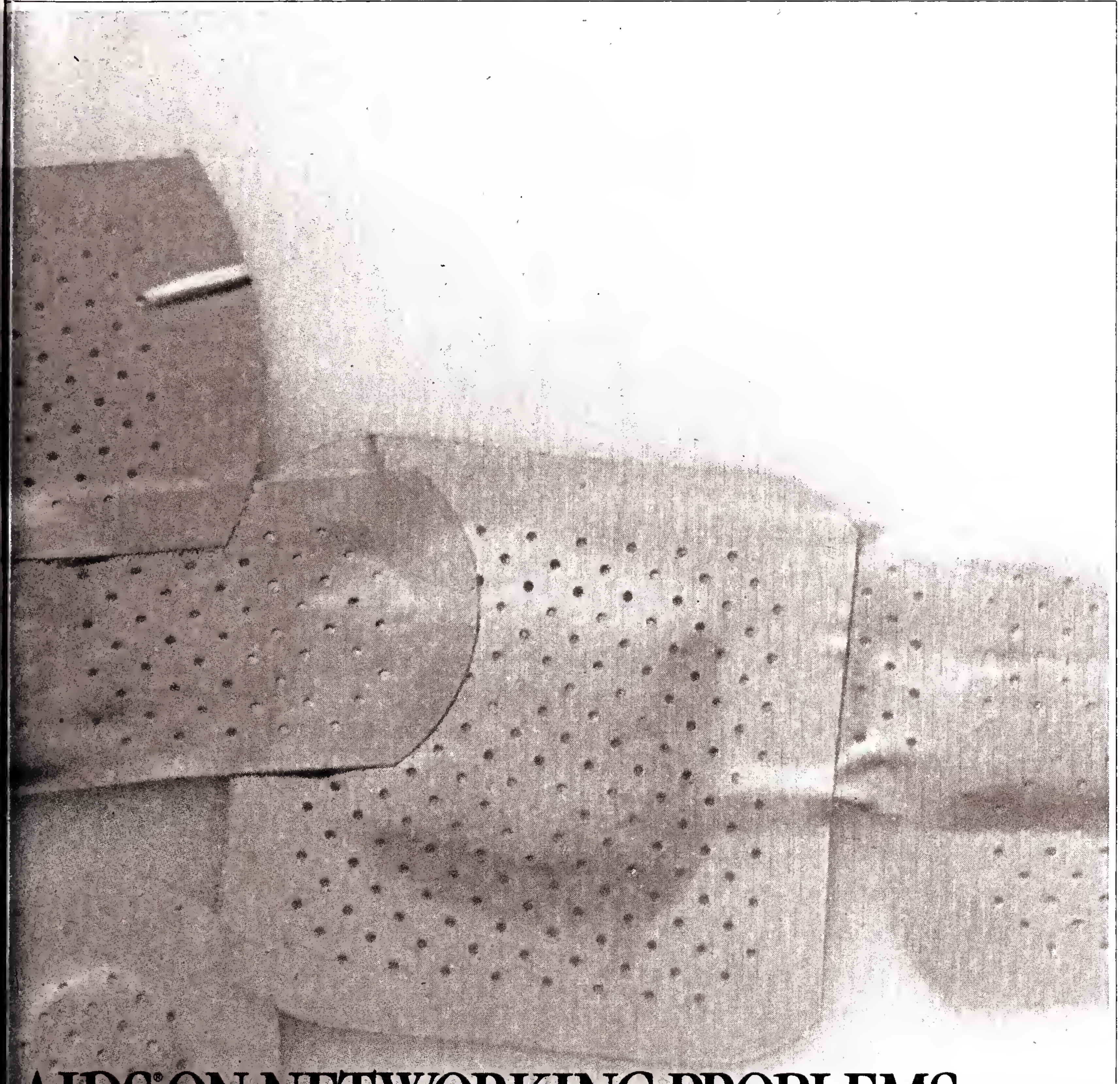
3270

from page 38

Brear was that the 3180 was supported on the System/36 and 38, as well as 3270 subsystems. While the 3180 Model 2 (a member of the 5250 series) shares keyboard, display and logic units with the 3270-compatible 3180 Model 1, the 5250-compatible 3180 Model 2 uses more complex microcode and a twin-axial interface, rather than the coaxial type A interface on the 3270 series. As IBM is sharing many component subsystems, logic units and enclosures in its various implementations of the Personal Computer to achieve manufacturing efficiencies, it would follow that a similar strategy in the terminal area would be followed without losing the ability to offer products that differ vastly.

A user who has committed corporate resources to the acquisition of 5250 series terminal equipment should be reassured that this investment will not soon be obsolete. ‡



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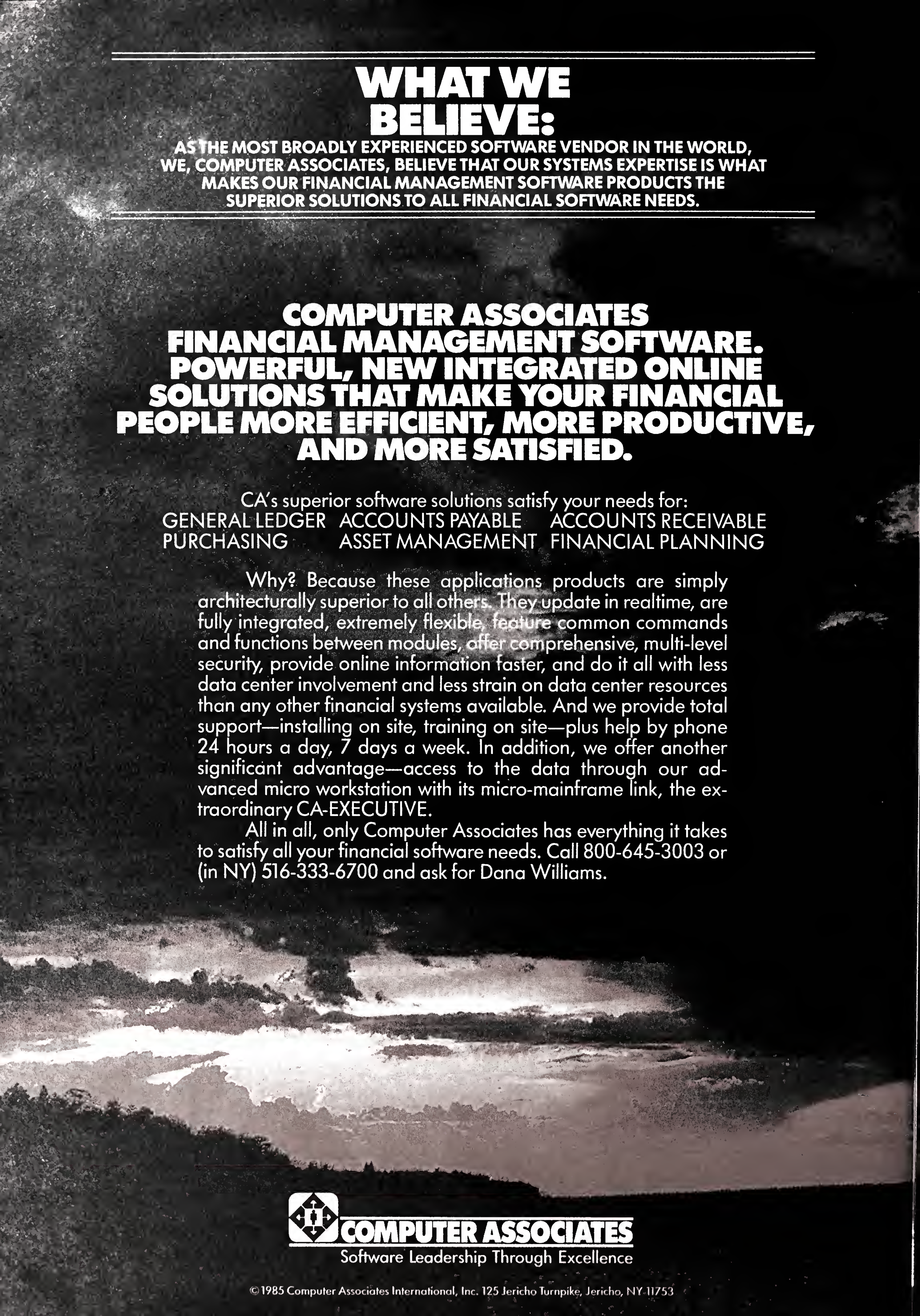

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SOFTWARE & SERVICES

SOFTLINE/WILLIAM INMON

Impact of standard work unit

First in a two-part series dealing with the concept of the standard work unit measurement and its impact on on-line systems performance.

The foundation of efficient on-line system performance is a concept known as the standard work unit. The standard work unit was initially born of experiences with on-line systems at McDonnell Douglas Automation Co. (McAuto) in St. Louis in the late 1960s and early 1970s. From its origin at McAuto, the standard work unit has spread to other on-line environments where there is a desire to have consistent, satisfactory on-line performance.

Once management goes beyond simply adding hardware to improve performance, it will discover that the long-term solution to better on-line performance is to control on-line systems from the moment of their design, ensuring that all on-line transactions conform to the standard work unit.

The standard work unit applies wherever there is an on-line system that has transaction and data integrity.

See **UNIT** page 45

Inmon is a director at Coopers & Lybrand in Denver, a noted author on the subject of data base design and a regular contributor to Softline.

Codd: Relational approach to DBMS embraced by users

By Maura McEnaney
CW Staff

CINCINNATI — Although somewhat hesitant about self-praise, E. F. Codd, founder of the relational data base model, said he expects his relational approach to data base management to be a lasting one.

"The relational approach is going to be around for a long time," Codd told attendees at Cincom Systems, Inc.'s annual user group meeting held here recently.

In explaining the concepts of his relational data base model, Codd said he believes relational systems have been widely embraced by users because they allow data to be easily distributed, give end users a wider variety of data views and provide a flexible authorization system for data base administrators.

Codd said he was driven to develop the relational model after examining the data base management systems of the 1960s. "I

See **CODD** page 50

TIS schools user in facility control

By Maura McEnaney
CW Staff

CINCINNATI — Sara Hooper came to Cincom Systems, Inc.'s Interact '85 users group conference here hoping to meet users of Cincom's TIS data base and applications-development-oriented tools.

As project manager for Auburn University's administrative computing department in Auburn, Ala., Hooper is using TIS with the hope of adding some structure to the school's facilities management.

Auburn runs an IBM 3032 mainframe under MVS with CICS. According to Hooper, the school is creating a data base for implementation of an automated facilities management system using TIS. The system is intended to help Auburn keep better records on the approximately 250 buildings on campus, she said.

See **AUBURN** page 50

SOFTALK
Maura McEnaney
CW Staff Writer

Cincom sports new look to aim for top

For Cincom Systems, Inc., the recent Interact '85 event was more like a coming-out party than a users group meeting.

Once a modest company that enjoyed the success of its Total data base management system (DBMS), Cincom is hoping to take on the giants of the software industry by first taking on a new look. Cincom is sporting a new president, a new package of products and a new emphasis on marketing that it hopes will catapult it from a $100 million a year company to a $500 million a year company by 1990.

Cincom Systems
A World Of Experience For Today's Business World

Last year Cincom restructured its management team, putting Dennis Yablonsky, formerly Cincom's director of marketing and sales, into the president's office and moving Thomas Nies, the firm's founder and former president, into the chief executive officer post. Management directions at Cincom will not differ greatly from their present course, said Yablonsky, who told *Computerworld* that he shares the business philosophy of his predecessor.

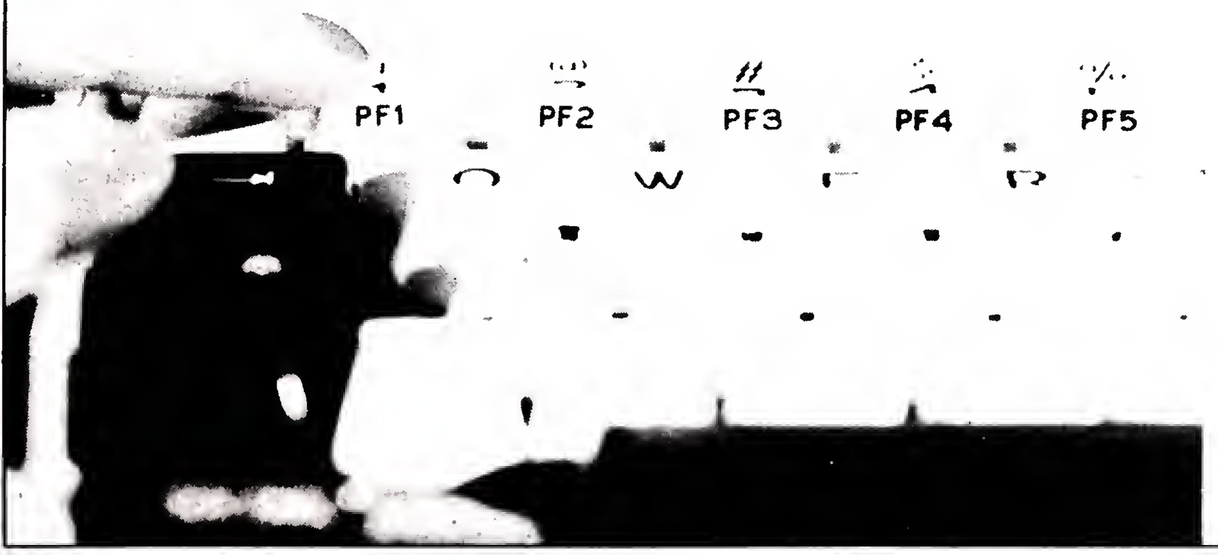
However, the current emphasis on marketing comes through loud and clear. Yablonsky is a dynamic, outspoken executive with an extensive sales background. Four of his six current vice-presidents have some responsibilities within the marketing or sales areas and, in a year and a half, the sales team has more than doubled to nearly 200 sales representatives, he said.

Cincom's management team is giving increased attention to its integrated products, including its TIS DBMS-related products, widely installed Mantis fourth-generation language, tools for data base administration, applications software, a micro-mainframe connection and a net-

See **CINCOM** page 50

- Gannett New Media Services unwrapped an on-line news summary service — based on the *USA Today* newspaper — accessible via micro or terminal/**42**
- Data Kinetics released an automatic table handling system for IBM mainframes/**42**
- Data Design Associates introduced an interactive query facility for its IBM-based financial applications/**42**
- Esca announced a micro-based decision support system and a link that allows for the transfer of mainframe data to the DSS/**43**

INSIDE
Systems Software/**43**
Productivity Aids/**48**



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Tablebase released in U.S. for use with IBM mainframes

OTTAWA — Data Kinetics Ltd. has announced the U.S. release of Tablebase, an automatic table handling system for IBM mainframes.

A spokesman said the product is designed for use with either IBM's MVS or DOS operating system and automates the management of data in virtual memory.

Tablebase provides table searching and data reorganization capabilities and increases users' control of applications systems, according to the vendor.

Tablebase reportedly reduces processing time, system maintenance and coding requirements.

It allows users to take better advantage of current IBM hardware architecture and core memory facilities, including Extended Architecture, and allows flexible restructuring of data in core memory, the spokesman said.

Tablebase supports several teleprocessing interfaces, including IBM's ISPF, IMS/DC, CICS and others.

Tablebase is priced at $25,000 for MVS and $15,000 for DOS.

More information about Tablebase is available from Data Kinetics, located at 97 Norman St., Ottawa, Ont., Canada K1S 3K5.

Data Design introduces interactive query facility

SUNNYVALE, Calif. — Data Design Associates has introduced an interactive query facility for its applications software packages for IBM mainframes under OS and DOS. The company also announced an interface to IBM Personal Computers.

According to a spokesman, DD-View is said to eliminate the need for a report writer by allowing users to create on-line queries. Query definitions created by users can be saved. As definitions are created, selected formats are displayed at the bottom of the screen. When users select an erroneous definition, the system displays an error message and the cursor is displayed in the field needing correction.

The company's DD-Link allows Personal Computers and compatibles to emulate mainframe terminals. With DD-Link, mainframe data is reformatted for compatibility with spreadsheet programs for Personal Computers. Both DD-Link and DD-View are integrated with Data Design's mainframe applications.

DD-Link costs $10,000. DD-View is available with Data Design's applications packages, which cost between $21,000 and $66,000 depending on the modules selected.

Data Design is located at 1279 Oakmead Pkwy., Sunnyvale, Calif. 94086.

Gannett offers on-line news

WASHINGTON, D.C. — Gannett New Media Services, a division of Gannett Co. and publisher of the *USA Today* newspaper, has announced USA Today Update, an on-line news summary available through three information networks.

A spokesman said USA Today Update summarizes news from some 200 national and trade news sources including wire services, major metropolitan newspapers and broadcast outlets.

The summaries are targeted to specific businesses and industries. The news summaries, dubbed Decisionlines, are typically 20-paragraph capsules of developments in industries such as banking, insurance, law, energy, travel, telecommunications, technology and real estate. Updated Decisionlines are available at 9 a.m. EST each business day.

Offer more in-depth look

In addition, USA Today Update's Hotlines summaries offer compilations of general, financial, weather and international news from 8 a.m. to 11 p.m. EST. The service's Special Report summaries, which are provided in question-and-answer format, offer a more in-depth look at topics of interest.

USA Today Update is prepared by a staff of journalists based in Arlington, Va. The service can be accessed via terminal or microcomputer over dial-up lines through information networks including General Electric Information Services Co. (Geisco), H & R Block Co.'s Compuserve and Newsnet, Inc.'s Newsnet.

As an example of pricing for USA Today Update, rates from Geisco, which are discounted based on usage, begin at $40/hour for corporate users. With a 10-hour monthly minimum, the rates are $36/hour; 20-hour monthly minimum, $32/hour; 50-hour monthly minimum, $30/hour; and 100-hour monthly minimum, $28/hour, a Gannett spokesman said.

Gannett New Media Services is located at P.O. Box 450, Washington, D.C. 20044.

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Esca offers IBM-based DSS, link

CHICAGO — Esca, Inc. has introduced an IBM Personal Computer-based decision support system (DSS) and a micro-mainframe link that allows users to transfer data from an IBM mainframe to the DSS.

A vendor spokesman said Esca Mainframe Link (MFL) permits users of its Esca-DSS to retrieve data from a mainframe data base without using data programming terms. Esca MFL runs as an IBM CICS application that transmits selected data from IBM's MVS operating system data files to the micro.

Users must be authorized to log on to CICS and enter the correct password in order to begin a session, the spokesman said. A user data view capability allows data elements available to the user to be sent back to the micro. Esca MFL incorporates a data dictionary that keeps a list of DSS users and the data bases they can access.

Esca MFL costs $60,000. It is currently being beta tested and will be available in the fourth quarter.

Esca-DSS is a menu-driven program said to provide business analyses functions without the use of a command language. The spokesman said users can retrieve data, draw graphs, perform statistical functions or view results by using a mouse or cursor keys. Users can simultaneously gather information and analyze it in different ways. A modeling function handles multiple dimensions without the need to rebuild the product's spreadsheet when data is added.

Esca-DSS costs $2,000 per copy and will be available in the fourth quarter.

Esca is located at Suite 650, 312 W. Randolph St., Chicago, Ill. 60606.

SYSTEMS SOFTWARE

■ **Main Frame Software Products Corp. has announced Screens, a utility that allows users to create and maintain screens in an IBM IMS/DC environment.**

A vendor spokesman said Screens can bypass IBM's MFS facility. Memory is saved because the MFS buffer pool is no longer required. Screens does not access IMS libraries to format information to be displayed or read, thus allowing the number of inputs and outputs for each transaction to be lowered. A "hard-linking" facility can be used to eliminate inputs and outputs to the data base.

The product includes an applications windowing facility that lets end users design screens. Default capabilities allow the user to create or change Screens from an IBM terminal while IMS is active. Screens can be developed under IBM's TSO and migrated to IMS.

A permanent site license for Screens is $10,000.

Main Frame Software Products, 135 Glen Road, Wellesley, Mass. 02181.

See **SOFTWARE** page 44

Honeywell unveils tools for DPS line

Adds info retrieval, graphics packages

PHOENIX — Honeywell, Inc. has announced Texto, an interactive document management and information retrievel system, and the Business Graphics Option module for the Honeywell Financial and Corporate Planning System (HFCS). Both products run on the company's DPS 8, DPS 88 and DPS 90 mainframes under the Gcos 8 operating system.

Texto, developed by Chemdata, S.A., is a productivity tool for the organization, storage and retrieval of textual data, a spokesman said. The product allows users to create a document data base, then cross-reference the stored documents through user-defined keywords. The user builds a library of documents, catalogs or index files by entering information on blank forms supplied by Texto. The system then creates form letters, mailing labels, sorted and formatted lists or user-defined reports.

Chemdata's Logotel option was announced as a command language for Texto to provide a simplified user interface to the Texto data bases. Logotel is said to enable the end user unfamiliar with Texto commands or applications to enter requests for information. The Logotel option also permits the user to list and save a set of commands for routine procedures.

The Texto document management system is available now for $35,000. The license fee for Logotel is $13,200.

The HFCS analyzes data and provides a base an organization can use to build interactive analysis models, according to the vendor. The Business Graphics Option translates HFCS models into full-color histograms, pie charts, bubble plots and line and star charts.

HFCS is available for a license fee of $3,760. The HFCS Business Graphics Option is available for a license fee of $13,440.

Honeywell can be reached at P.O. Box 8000/A-79, Phoenix, Ariz. 85066.

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SOFTWARE

from page 43

■ **Applications Software, Inc. (ASI) has introduced a version of its ASI/Inquiry, software that supports downloading of data to the IBM Personal Computer from mainframes running IBM's IMS/DB/DC or CICS.**

ASI Inquiry reportedly incorporates an architecture based on real-time query of IBM's DL/1 data base management system and supports downloading to such personal computer software as Lotus Development Corp.'s 1-2-3 and Ashton-Tate's Dbase III.

The software also offers an ability to do ad hoc code generation and an internal clock that prioritizes system resource allocation.

ASI Inquiry costs $72,000.

ASI, 5455 Garden Grove Blvd., Westminster, Calif. 92683.

■ **Software Research Associates has announced that its Test Coverage Analysis Tool (Tcat) software now supports the C language.**

According to a spokesman, versions of the Tcat/C system are available for Digital Equipment Corp. VAX series minicomputers under the VMS or AT&T Unix operating systems and for IBM Personal Computers under PC-DOS.

The product consists of a C "instrumenter," a runtime program that collects test coverage data and writes trace files, and a coverage analyzer that produces coverage numbers. Also included are an interactive runtime package, utilities for manipulation of trace files, a trace file archiving facility and on-line Help screens.

Tcat/C costs $2,500 for a single CPU perpetual license, $9,000 for a multiple CPU site license and $975 for a single-user micro license.

Software Research Associates, 580 Market St., San Francisco, Calif. 94104.

■ **Adaroc, Inc. has announced the Resource Account Management and Statistical Exception System (Ramses) job accounting and resource management system for IBM's System/38 minicomputer.**

Written in RPG-III, the program is said to track and provide exception and summary reports on devices in the system, including CRTs and printers. The system's financial management charge-back capabilities provide job accounting and resource usage monitoring.

Ramses costs $2,995.

Adaroc, P.O. Box 263, Shrewsbury, Mass. 01545.

■ **Uccel Corp. has announced Release 1.3 of its Automated Job Management System for automating batch job restarts and reruns. UCC-11 runs on IBM or compatible equipment under OS operating systems.**

Release 1.3 reportedly uses dynamic allocation for performing maintenance on the system's two data bases. In addition, the enhanced UCC-11 is said to expand several online functions, simplifies installation and revises documentation.

Release 1.3 includes tools to evaluate the impact a restart/rerun may have on subsequent jobs. The features are said to help identify potential problems and to increase the efficiency of recovery.

The one-time license fee for UCC-11 is $21,000.

Uccel, Uccel Tower, Exchange Park, Dallas, Texas 75235.

■ **Exsys, Inc. has announced that its expert system for software development is available for the Data General Corp. Eclipse MV series of mini- and superminicomputers under the AOS/VS operating system.**

Exsys is written in C language and was developed in New Zealand by Adata Software Ltd. The expert system is said to cut program development time by allowing systems analysts to design applications by defining them, with no programming or testing required. Documentation is provided automatically by Exsys.

All Exsys programs are integrated with the same file structures, data relationships and cross-referencing of data and procedures, a spokesman said.

Exsys is a member of DG's Independent Software Vendor program. The product was developed with research money provided by DG.

Prices for Exsys range from $20,000 on the MV/4000 to $125,000 on the MV/10000.

Exsys, Tower 56, 126 56th St., New York, N.Y. 10022.

■ **Productivity Products, Inc. has announced Focusout and Focusin for enabling users of Information Builders, Inc.'s Focus fourth-generation reporting and retrieval tool to generate file descriptions from the IBM DB/DC Data Dictionary.**

Focusout supports Focus users in the IBM MVS and VM/CMS environments.

According to a spokesman, Focusout creates Focus file descriptions for operating systems' flat files, IMS data bases, CMS files and Information Builders' PC/Focus files.

The Focusin programs enables users to fill the data dictionary with information on their current systems.

The price for Focusout and Focusin is $15,000; Focusout alone is $10,000.

Productivity Products, P.O. Box 26, Vernon Hills, Ill. 60061.

■ **P-Stat, Inc. has announced that its P-Stat 8 data management and analysis software is now available for the Control Data Corp. Cyber 180 mainframe.**

P-Stat 8 combines interactive data and file management, data display, statistical analysis and report writing capabilities in a single package, a spokesman said. The package features on-line help, interactive data

Continued on page 48

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UNIT

from page 41

For on-line systems where there is no transaction and/or data integrity — and there are such systems — the standard work unit is not useful. Typical environments where the standard work unit is the key to improved on-line performance include IBM's IMS/DM/DC, IMS/CICS, CICS/Vsam, SQL/DB2, Cullinet Software, Inc.'s IDMS/DC and IDMS/CICS.

The standard work unit has many forms. Variations of the standard work unit measure from one data center to another depend on such things as the following:

- The maximum transaction arrival rate.
- The overhead associated with the execution of any on-line transaction.
- The work being done by each on-line transaction.
- Machine size, speed and competition among programs operating on the machine.
- The speed with which I/O is done.
- The base software driving the on-line environment.

The standard work unit is best understood in terms of an analogy. Consider the dynamics of an hourglass. Inside the hourglass are grains of sand. The grains of sand are small and uniform in size. They queue on top of each other, all trying to get to a critical resource — the bottleneck in the hourglass. Once in the bottleneck, the grains of sand quickly flow through.

The grains of sand can be compared to on-line transactions. The bottleneck of the hourglass can be compared to an on-line controller such as IMS, CICS and IDMS. The rapid flow of the grains of sand through the bottleneck can be compared to fast and efficient on-line performance.

Now consider what happens when pebbles are put in the hourglass along with sand. The pebbles take a long time to pass through the bottleneck. Even worse, the pebbles passing through the bottleneck prevent the grains of sand behind them from getting to that resource in the first place. The result is an uneven flow through the bottleneck.

Runs at speed of slowest transaction

The same effect occurs when long-running transactions are mixed with short-running transactions in an on-line environment. Performance becomes spotty and uneven. The system runs at the speed of the slowest transaction being executed.

What are the factors that affect the speed of a transaction? The primary factor affecting transaction runtime is the amount of I/O the transaction executes. I/O operates in terms of milliseconds, while internal program execution operates in terms of nanoseconds — a difference of about two orders of magnitude. Also, program logic is such that it must wait until I/O is executed.

If on-line transactions are to yield good performance, they must all execute only a small amount of I/O. There must be no single transaction that executes a large amount of I/O mixed in with other transactions that execute only a small amount.

Unfortunately, determining the amount of I/O executed by an on-line transaction is no simple task, especially for programmers who think in terms of logical flow and not of actual physical program execution. At least indirectly — and often directly — the amount of I/O a transaction requires depends on the number of data base calls requested by the programmer. While most programmers do not think in terms of access method execution, which is necessary to determine how much I/O is done, programmers do think in terms of data base calls because those calls are a part of their logical flow. So phrasing the standard work unit in terms of data base calls reduces the necessary transaction control to a level intelligible to programmers.

The most basic form of the standard work unit requires that every transaction will do no more than *n* calls. McAuto planners originally suggested a maximum of 35 calls, but that figure varies from shop to shop.

However, there is other overhead associated with transaction execution that impacts performance as well as the amount of I/O done. For example, a very large program may issue only a few calls. But moving the large transactions in and out of memory, or worse yet, leaving the large transactions resident in main memory requires its own overhead. Thus, a refined version of the standard work unit might mandate that every transaction will do no more than *n* calls, be no larger than *m*K bytes of object code and use no more than *p* seconds of CPU time, where *m*, *n* and *p* vary from shop to shop.

Further refinements possible

But there are further possible refinements to the standard work unit. In most DBMS, some calls require a large amount of I/O, while other calls do not use I/O at all, depending upon the storage of data in the buffer and the usage of buffers to satisfy secondary calls to the data base. So an arbitrary number of "points" — points having no technical connotation — can be allotted for any transaction, where different data base calls have a different point weighting.

For example, an on-line transaction may be allowed up to 150 points, where a direct retrieval counts for 10 points, a sequential retrieval counts for one, a deletion counts as 15, an insertion counts as 10, index maintenance counts as two points for each index and so forth.

The net result of the application of the standard work unit across all on-line transactions is the creation of a structured environment. It is that structuring of the environment that yields good on-line performance.

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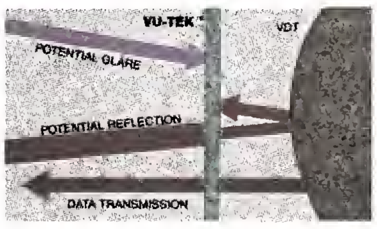

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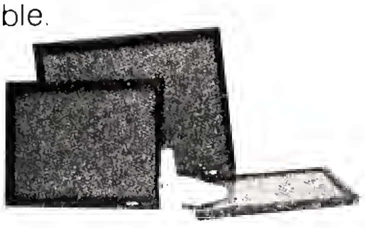

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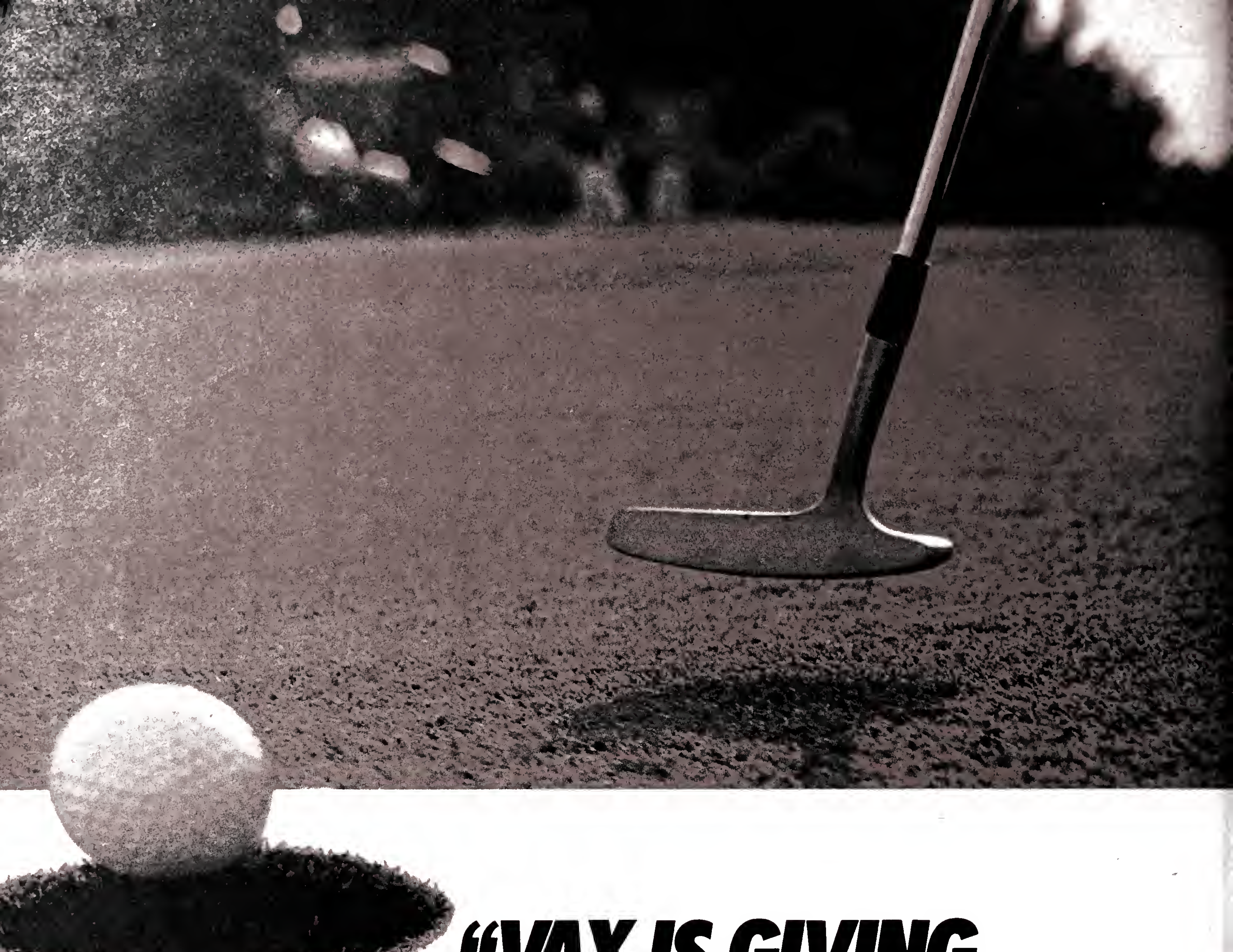

"VAX IS GIVING AMF MORE TIME FOR THE THINGS THAT REALLY MATTER."

Michael Lilly
Director Corporate MIS Operations
AMF Incorporated

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As Michael Lilly says, the company's decision to stake its future in MIS on Digital's VAX computers – and the office automation tools like All-In-1,™ DECnet™ and DECmail™ software that run on them – was hardly a snap judgment.

Every major computer company was considered. Lilly says that, "dollar for dollar," only Digital's VAX system offered the power, ease of use and communications capability with other computer systems – including IBM – that AMF needed.

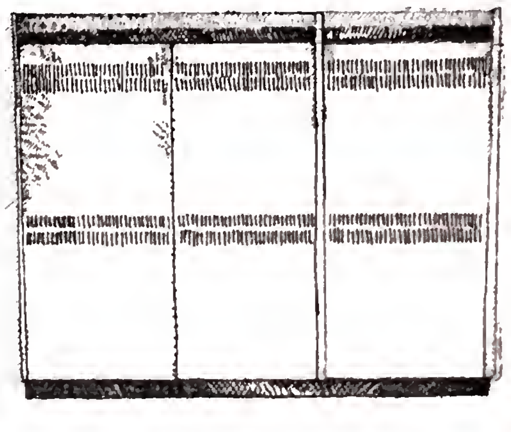
So AMF chose the VAX computer – the best-selling 32-bit computer in the world – and waited to see what the machine could do.

"SUDDENLY WE HAVE TOOLS AND CAPABILITIES WE NEVER HAD BEFORE."

Lilly and his group didn't have to wait long. The system was up and running within days.

Reaction within the department was rapid and gratifying. "We really got excited about it," says Lilly. "Immediately, we were communicating better." And there was more – spreadsheets and word processing and a mail system. "Suddenly," Lilly said, "we had a vehicle for total open communications to every important person or department in the corporation."

Part of the story behind AMF's almost instantaneous rapport with the VAX system is that it's so easy to use. Menus and operating commands are the same for each fully integrated application. Whole functions are completed in as few as two keystrokes. And because everything is in plain English, it's literally as simple as A-B-C to incorporate



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any VMS™ application into the daily work routine.

"INSTEAD OF SIX WEEKS TO DEVELOP AN APPLICATION, IT TAKES TWO."

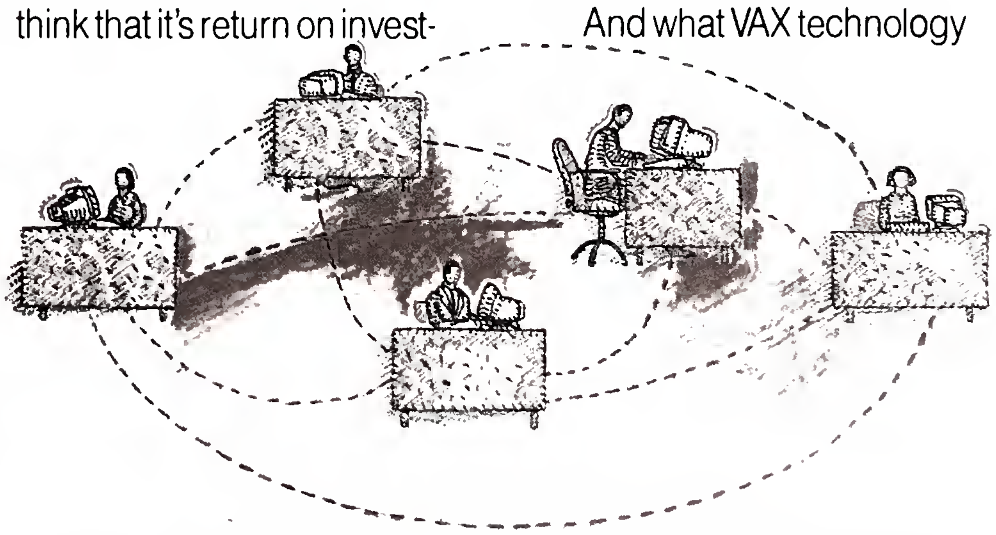
VMS software development tools have so improved the way things are done in his department, Lilly says, that he projects the savings in applications development time and costs alone at some 70 percent.

"Many of our new applications here at AMF will be written on that machine. I can't quantify it exactly. All I know is that I'm getting a heck of a lot more bang for my buck."

The first tests of VAX equipment proved so successful, that AMF quickly enlarged the system, adding terminals and DECmate™ and Rainbow™ personal computers. New departments went on line, for example finance.

"And that," says Lilly, "really created an explosion." Now AMF is implementing programs like general ledger systems, stock options and inventory systems, and keeping more efficient and flexible records, from accounts payable to personnel.

Adds Lilly, "People here are screaming to be on the VAX system, and there's got to be a reason for that. And I tend to think that it's return on investment, mailing lists, discounted cash flows, spreadsheets they couldn't even begin to do before, versatility, tremendous graphics potential. It's just a whole world of opportunity that is elevating AMF to the forefront."



"ANYONE WHO USES VAX IS GOING TO GET THE COMPETITIVE EDGE."

Lilly feels the VAX system has already elevated his own department to the forefront.

"It's put corporate MIS on the map," he says. "It has effectively increased productivity and efficiency. People are beginning to believe we can do the things we say we are going to do."

And what VAX technology is doing for his group, Lilly believes, it can do for all of AMF, or indeed for any company. "Any corporation that employs this technology," he says, "is going to get the competitive edge.

"This technology will explode. Because there are a thousand reasons to have it. But what it really all boils down to is this: everybody will want a VAX system because they can do the job better, faster and more efficiently.

"And that's what really matters."

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Continued from page 44

entry, relational data base capabilities and an English-like command language.

According to the vendor, P-Stat 8 is available on all models within the Cyber 180 line including the CDC Cyber superminis, Models 810 and 830.

The prices for P-Stat 8 range from $13,000 for Model 810 to $15,000 for Model 990.

P-Stat, P.O. Box AH, Princeton, N.J. 08542.

PRODUCTIVITY AIDS

■ **OBS Software Co. has introduced a CICS application development system for IBM mainframes running MVS.**

Qwik/CICS enables end users to create and modify program selection menus, Help text, transaction error message text and network broadcast messages, a spokesman said. It automatically generates CICS command-level Cobol source statements.

Qwik/CICS contains a field-level security feature and reportedly is available with an interface to higher level security software, including Cambridge Systems Group, Inc.'s ACF2 and IBM's RACF.

A license for Qwik/CICS costs $29,000.

OBS Software, 115 Sansome St., San Francisco, Calif. 94104.

■ **Duquesne Systems, Inc. has announced Release 6.0 of its Shared Dataset Integrity Plus (SDSI Plus) productivity aid for data management. The product runs under IBM VS1, MVS and MVS/XA environments.**

Release 6.0 reportedly eliminates data integrity and protection problems caused by simultaneous access of the same data, according to a spokesman.

The product reportedly offers enhanced job requeue processing when no Dasd is available and is said to exploit the faster I/O available on IBM 3084 and the recently announced 3090 series processors.

Other enhancements to Release 6.0 include a conflict display feature that provides information about local and cross-systems problems and a hardware reserve display that aids in diagnosing reserver interlocks.

For a two-CPU shop, the permanent license fee for SDSI Plus is $14,000; a permanent license for shops with an unlimited number of CPUs is $19,000.

Duquesne Systems, Two Allegheny Center, Pittsburgh, Pa. 15212.

■ **Westmoreland Systems, Inc. has announced Version 3.0 of its Application Design & Development (ADD) system for the IBM System/34 and 36.**

Enhancements to Version 3.0 make the system easier for nonprogrammers to use, a spokesman said. Also included is a simplified 20-page manual providing an introduction to the system.

The ADD system can create job streams consisting of combinations of sorts, reports, prompt screens, OCL procedures, batch programs and on-line inquiry and maintenance programs. In Version 3.0, the process of setting up a job has also been streamlined, the spokesman said.

The price for Version 3.0 of the ADD system is $3,500.

Westmoreland Systems, P.O. Box 2726, Suite 1, 228 Park Ave. N., Winter Park, Fla. 32790.

■ **CS Laboratories, Inc. has introduced C/Script II Plus Isam, an applications development tool for Data General Corp. computers under DG's AOS and AOS/VS operating sytems.**

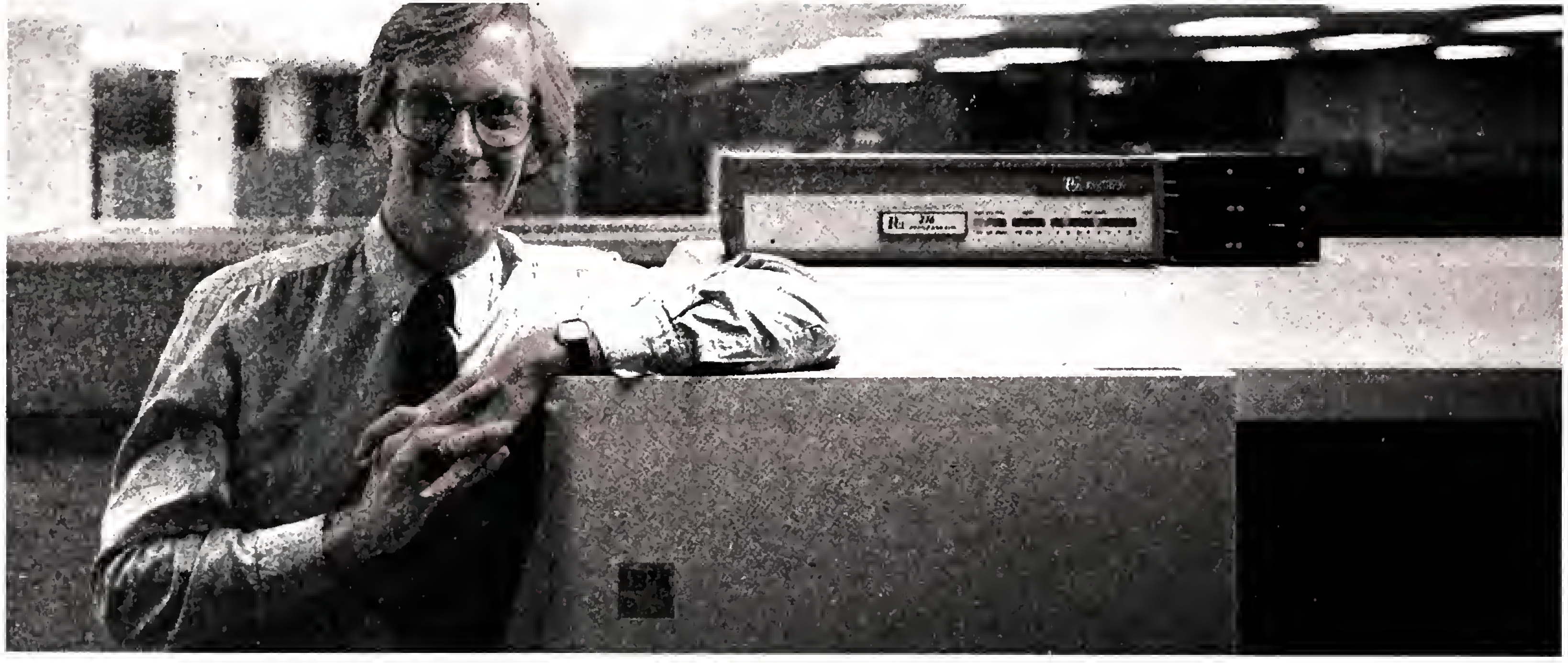
C/Script II Plus Isam allows users to generate Isam reports, file maintenance, inquiry and audit report programs through DG's Infos II Data Base Access module. The product automatically generates Cobol I/O source code, the vendor said. Changes in the file maintenance records can be tracked through the product's transaction logging facility.

Users can generate file maintenance programs with defaults displayed within or outside of fields. Up to 99 screens or windows per file maintenance program can be accessed for data input. Screens can then be viewed sequentially or selected from a screens menu.

C/Script II Plus Isam sells for $12,000 for AOS, and $16,000 for AOS/VS.

CS Laboratories, 459 N. Dean Road, Auburn, Ala. 36830.

PCI introduces remote IBM PC to IBM host access with auto callback security.



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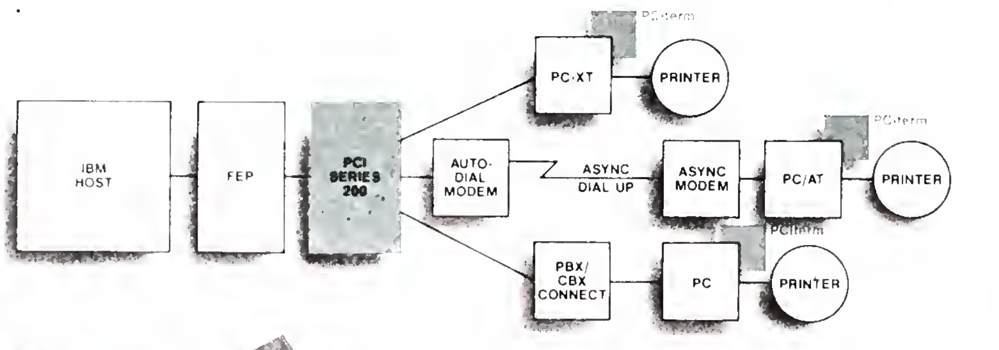

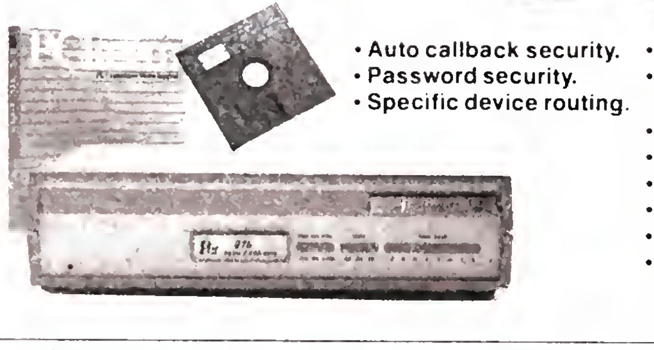

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CW

CODD from page 41

was horrified by how complicated those systems were," he said. The relational model was the result of efforts to eliminate what Codd called "the rigidity" of those systems' data base structures.

"If you wanted to make changes to the data base, you had to take the system down and modify it using utility programs," he said.

Nonrelational DBMS technology forced computer departments to bear the "tremendous burden of maintaining those systems," Codd said. That technology also exhibited little concern for the needs of end users, he said.

Concise, simple

"The aim of relational was to [give end users and applications programmers] a concise and simple way to get at data," Codd explained.

The relational model that Codd subsequently developed eliminated the importance of a record's positional address and instead relied on characteristics like column headings and domain-constrained operations. "In the relational model, rows and columns can be shuffled without a loss of information," according to Codd. In addition, he said, a data description in the data dictionary can be changed without bringing the system to a halt.

According to Codd, a greater number of data management systems will incorporate the relational model in the future. Other important developments will center around distributed data bases, Codd said.

Cincom Systems
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"We will see the development of distributed systems that are much more powerful than [those that exist] today," he said.

Codd said the relational approach lends itself better to environments where the data base is located in a remote site.

This approach is economical, he said, because requests can be made for multiple records. "If I were an executive in a company that had data distributed in two cities, I would rather put my trust in a [relational] system than in applications programmers," Codd said.

AUBURN from page 41

Currently, records on Auburn buildings are in a bit of a disarray. Four departments — the university architect, analysis and planning, risk management and property control — all maintain records about university structures. The school's risk manager, for example, handles insurance coverage for all the buildings and needs the information to complete insurance applications.

And, according to Hooper, each department has its own way of tracking building information. For example, some departments identify buildings by name in alphabetical order, others use numerical classifications, she said.

"You could go into any of the offices and ask how many buildings there are on campus, and you would get four different answers." Records on the buildings are currently kept on a sequential file tape on the mainframe, and there is no interface between the different departments, she explained.

Auburn's ultimate goal is to have one record for each building, with all offices sharing the data. The school is hoping Cincom products will help. "The TIS concept allows us to have one record and lets the data base administrator control who is updating what is in that record," she said. With the planned system, she added, "if there is a $20,000 piece of equipment assigned to the chemistry department, [the university] can be sure that the room it's in is also assigned to the chemistry department."

The facilities management system is the first big application the university is tackling using TIS' Logical User View component, the relational aspect of its DBMS. Although Auburn's MIS department had some trouble interfacing Cincom's Mantis fourth-generation language with the data base, Cincom's support center helped iron out those problems, she said.

And if all goes according to schedule, the facilities management application will be fully operational by the end of the year.

"We have a commitment that any in-house project we develop will be developed using TIS," she said. One other possible application is development of a student record system, she said.

CINCOM from page 41

work management system.

"We are not just the Total people any more," Yablonsky said. "We've spent a lot of money over the past five years building products, and [Nies] believes we now need to spend an equal amount of money promoting what we have."

Cincom's philosophy may be likened to that of industry powerhouse Cullinet Software, Inc., which builds sales around its IDMS DBMS. "That approach works," Yablonsky said.

Cincom is hanging some of its future success on the prospect of sales of TIS to IBM DOS users. Cincom used Interact '85 to launch Release 2.0 of TIS which, for the first time, provides support for DOS users. Yablonsky believes the announcement will open doors for Cincom, which is hoping to leverage its existing client base. Of the approximately 2,500 IBM mainframe sites using Total, Yablonsky said, 50% to 60% are DOS shops, and the potential of swinging those users over to TIS offers some significant possibilities for Cincom. "Up until now, we've only been playing in a portion of the market," he said.

Although it has enjoyed success in the DBMS and fourth-generation language markets, Cincom is preparing for the day when IBM unveils a cohesive DBMS strategy. "In the short term, we think [IBM's] software strategies have been our biggest friend," he said. "From here on out you can expect to see IBM raising its software prices about 30% a year. And the more IBM charges for its software, the more value we can put on ours."

If IBM bundles the functions of its operating system, teleprocessing monitor and data base manager or microcodes some of the capabilities of its DBMS, Yablonsky feels that "that is not going to hurt us.

"We'll still be selling Mantis, we'll still be selling query languages, we'll still be selling the directory for the Logical View processor, but we'll be selling it as a cap over the top of an IBM data base machine," Yablonsky added.

"IBM will eventually take 80% to 90% of the data base market. But we don't care. We're giving our customers good data base software today. If customers decide in the future that there is better data base management software, fine. But they will still want our Logical View, Data Directory and Mantis products," he said.

Even with the increased emphasis on marketing, research and development remains a high priority at Cincom. The company will spend $250 million over the next five years on R&D, five times what it spent during the last five-year period, Yablonsky told users.

"We're trying to put our company into a position where no matter what IBM does, [it] can't hurt us. You can't just market your way out of that problem," he said.

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COMPUTERWORLD

Update

May 6, 1985

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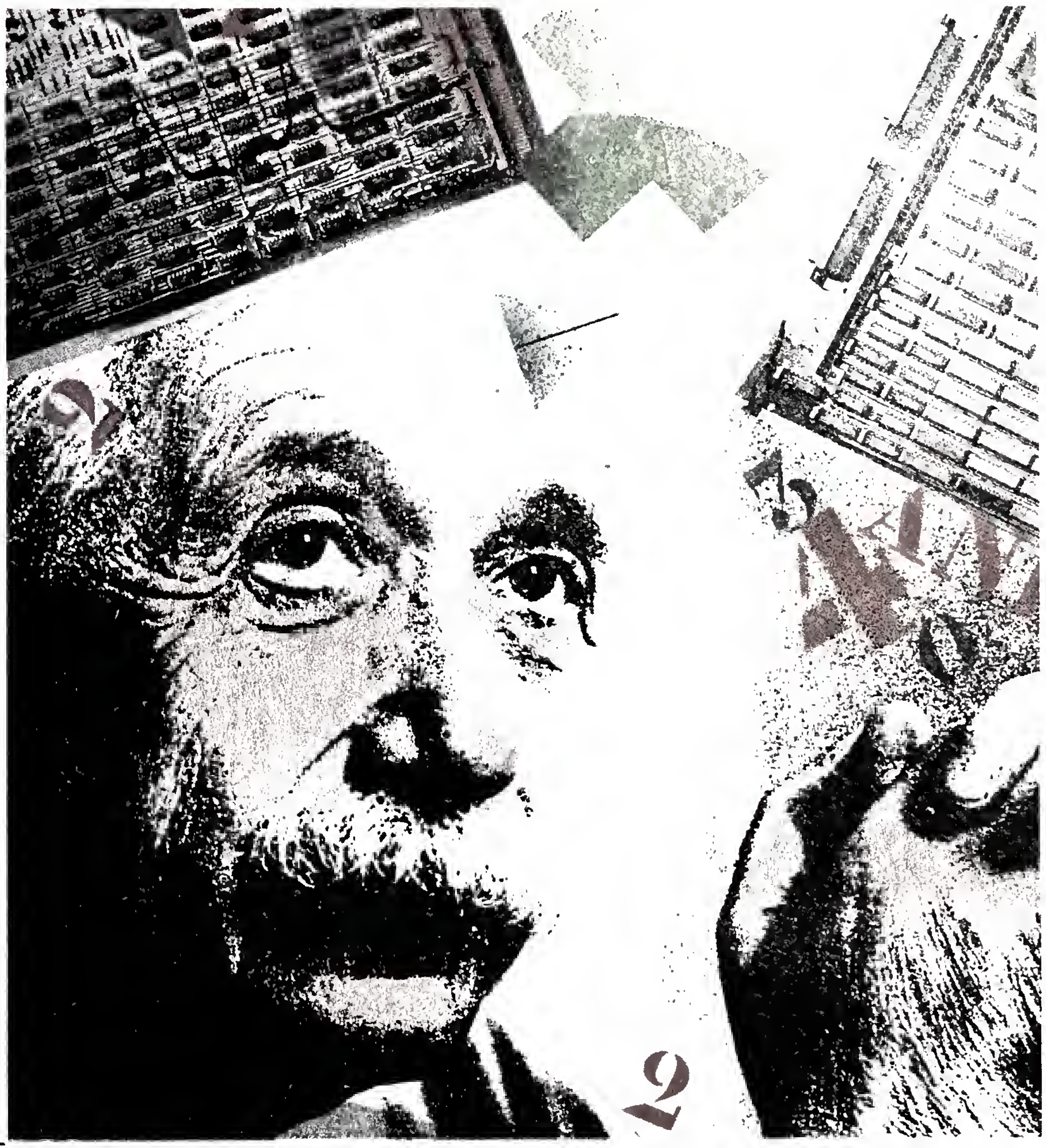
Update

Toward the fifth generation

The mind of man is capable of anything — because everything is in it, all the past as well as all the future.
— Joseph Conrad

The future seems to me no unified dream but a mince pie, long in the baking, never quite done.
— E. B. White

By Glenn Rifkin
Update Editor



It is 1995 and the popular images of science fiction have been transformed into fact: intelligent humanoid machines in the form of robots; computers that see, hear, speak and reason; knowledgeable systems that are nourished by the input of a genius' storehouse of wisdom, able to hold and use that knowledge forever. A decade of intense research and creation has led to breakthroughs that have set the computer world at the threshold of fundamental change.

This script for tomorrow, however, is not from a Hollywood dream factory or the pages of an Isaac Asimov novel. These images are the very practical perceptions of researchers in both academia and industry, and the boundary between fact and fiction has grown increasingly hazy. The future is no longer measured in space odyssey fantasies but in the price/performance specifications of an industry waiting to explode. This is the fifth generation, the next significant step in the evolution of computing; the leap forward that, if successful, will bring the future in.

The fifth generation got its official start in October 1981 when Japan's Ministry of International Trade and Industry coined the term to describe its goal of creating powerful, intelligent computers by the mid-1990s. Since then, fifth generation has become an umbrella description encompassing work being done in the fields of parallel processing, artificial intelligence, expert systems, robotics, natural language, vision systems and more.

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ALAN DUNN, *SATURDAY REVIEW* MAY 5, 1956

Though much of the fifth-generation dream remains in an embryonic state, large sums of time, money and talent are being poured into its pursuit. Commercial applications for AI hardware and software — in the form of expert and knowledge-based systems — have begun emerging and are spawning what many consider to be the foremost future growth sector of the computer industry. DM Data, Inc., a Scottsboro, Ariz., consulting firm, has predicted that the market for AI products will reach $4 billion by 1990 (see chart Update/4).

Collaborative work between manufacturers and universities, much of which is funded by the U.S. Department of Defense, is focusing on long-range goals and, in many cases, producing unexpected short-term payoffs. While the blue-sky possibilities of academic research often attract the most media attention, the near-term realities have already shown enormous potential in a myriad of applications.

The fifth generation is not without controversy, however. Debate has raged around AI, for example, since serious work in that field began in the 1950s. Not only technological but moral and philosophical questions about the concept of intelligent, "thinking" machines abound. Though pioneering work has been done in many of the subgroups that fall under the AI mantle, critics claim that devising many of the algorithms needed to impart true human-like capabilities is simply not possible.

In addition, development of fifth-generation machines has, in some quarters, become a race between the U.S. and Japan for supremacy in these new technologies. Protagonists in the drive to organize America's push toward the fifth generation have argued that Japan, with its focused approach, is positioning itself to take a dominant role in what will be the worldwide market for intelligent knowledge processing machines (see Update/8).

This inaugural section of *Computerworld* Update will examine the march toward the fifth generation and where it might lead. As these technologies come down from the dizzying heights of speculation to the shelves of DP shops in corporate America, what is in store? What form will the new hardware architectures and software applications take? How is the military spurring on major

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COVER ILLUSTRATION BY KAREN WATSON

FIFTH

from UPDATE/3

work in the field? Which companies and individuals are showing the way, and how is the rest of the computing world responding? And how will the DP or MIS manager be affected by the influx of new ideas and the products that follow?

Birth of a technology

The desire to create a machine capable of imitating intelligent human behavior has long held fascination for those dabbling in both science and science fiction. As computing technology began to mature in the 1950s, the idea of an intelligent computer, able to think, speak and move about on its own, took hold of a small group of university-based computer scientists, and the field of artificial intelligence was born.

For the next quarter of a century, however, the core of AI research remained an academic exercise in speculation. The computers delivered by industry were simply not powerful enough or versatile enough to take on the herculean task of reasoning.

The major centers of AI research, including MIT in Cambridge, Mass., Carnegie-Mellon University in Pittsburgh and Stanford University in Palo Alto, Calif., combined the available industry technology with their own wizardry and created prototype machines capable of running simple AI applications. These machines were used to initiate early research in expert and knowledge-based systems.

It has only been in the last five years, as the price and power of computers have headed in opposite directions, that AI has taken off as a viable commercial industry. Though the seeds and first fruits of AI have grown from traditional computing architectures, the consensus among leaders in the AI community is that a radical departure in computing will be necessary to reach the lofty goals to which the technology's boosters aspire.

The evolution of computational technology to date has generally been divided into four generations: vacuum tubes, transistorized circuits, integrated circuits and, finally, very large-scale integrated circuits (VLSI). While the computer industry is currently moving from the third generation of integrated circuits to the fourth generation of VLSI, work is already being done on the fifth generation of parallel processing.

Computer scientists now suspect that the sequential von Neumann approach (named for the pioneering mathematician John von Neumann) may be inadequate for building computers able to process information fast enough to usher in the age of AI.

According to W. Daniel Hillis, founder of Thinking Machines Corp., a fifth-generation computer start-up in Cambridge, Mass., "Programs become slow as they become smart. Today, we write [AI] programs that use a few hundred facts. We would like to increase this to a few million, but the programs already take minutes to make decisions that must be made in seconds. Scaled up, they could take years. So-called von Neumann machines, even if they are built of exotic, ultrafast components, are unlikely candidates for solving these problems, since they are limited by the speed of light."

Despite continuing work with exotic but flawed materials such as gallium arsenide

See **FIFTH** UPDATE/5

CW CHART

THE ARTIFICIAL INTELLIGENCE MARKET
(IN MILLIONS)

Market Area	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Expert Systems	4	9	17	38	74	145	245	385	570	810
Natural Language	5	8	18	40	59	125	210	320	465	650
Visual Recognition	10	22	51	116	168	260	370	500	660	840
Voice Recognition	5	7	11	20	33	55	85	140	200	270
AI Languages	3	5	8	12	21	35	45	65	80	105
AI Computers	28	56	103	217	364	510	710	970	1,250	1,570
Government Contracts*	20	30	40	50	95	150	150	155	175	200
TOTAL	55	107	208	443	719	1,130	1,665	2,380	3,225	4,245

* Not in total, already included in other areas

Source: DM Data, Inc.

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*Integrated systems contracts over $25,000,000 (does not include military, component and service awards), as reported in Electronic News, MIS Week and Computer Systems News between January 1, 1983 and December 31, 1984

FIFTH

from UPDATE/4

or Josephson junctions, which have the capability to dramatically speed up traditional sequential machines. "Computers as we have known them for the past 20 to 30 years are about as fast as we can make them," wrote B. L. Buzbee and D. H. Sharp of the Los Alamos (N.M.) National Laboratory in *Science* magazine.

"The demand for greatly increased speed can be met only by a radical change in computer architecture — from a single serial processor to a computer which is an aggregation of many parallel processors that can perform independent operations concurrently," the authors wrote.

Fifth-generation or non-von Neumann machines, which will either depart from or drastically alter current architectures, are under development in the U.S., Europe and Japan. These new supercomputers, employing parallel rather than serial processing, promise to bring about massive change in the computer industry during the next quarter century.

The concept of parallel processing is simple: Rather than having a single serial processor performing operations sequentially, the machine will employ thousands or millions of processors, each with its own small memory bank, working simultaneously on a single task or a multitude of tasks. The concept is not new. But the dramatic decrease in the cost of microprocessors has suddenly made the idea viable.

As many as 50 parallel processing projects are reportedly under way at U.S. universities, including MIT; Cornell University in Ithaca, N.Y.; New York University; Stanford; Carnegie-Mellon; and the University of Illinois These projects are being heavily funded by the the U.S. Department of Defense Advanced Research Projects Agency's (Darpa) strategic computing project. Darpa is seeking machines that will increase by several orders of magnitude the speed with which expert systems and AI can be processed.

To illustrate the power difference, the Gartner Group, Inc., a Stamford, Conn., consulting firm, pointed out that IBM's most powerful mainframes, the 3090 series, will operate at around 50 million instructions per second. The military is seeking to acquire machines capable of running complex expert systems at approximately 10 billion instructions per second.

Industry heavyweights such as IBM, Digital Equipment Corp., Control Data Corp. and others are already involved with parallel processing projects, and small start-up companies are finding their way into the fray. Thinking Machines, using research done at MIT, is at work on a prototype of its Connection Machine, a computer that uses 100,000 processors.

Though the company will not discuss the status of the machine, it is rumored that the prototype will be ready by 1986.

Parallel computation

Meanwhile, researchers such as Edward Feigenbaum of Stanford, are working on models for expert systems that will incorporate parallel computation. The problem of programming for parallel systems has not yet been solved and is considered a major obstacle to success. Feigenbaum is attempting to adapt for parallel processing a programming tool called the Blackboard Framework, which was originally developed at Carnegie-Mellon in the early 1970s, and actually make parallel the tool's Lisp programming language. The project aims to show that this way of organizing the tools and the language can boost processing speed by several orders of magnitude.

The idea of massive parallel processing machines has, not surprisingly, crossed over to the traditional area of vector processors or supercomputers (such as the Cray Research, Inc. X-MP and Control Data Corp.'s Cyber series) and has caused some confusion. These giant, multimillion dollar number crunchers have not been targeted for AI or expert sys-

See FIFTH UPDATE/6

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FIFTH

from UPDATE 5

tems work per se, but attempts to make them even faster have embraced the idea of parallel processing or non-von Neumann processing as well.

According to Sid Fernbach, a San Jose, Calif.-based consultant, a parallel processing machine might be referred to as a "social" vector-type machine, "because you can issue one instruction and have them all execute the same instruction at the same time.

"On the other hand, most of the parallel processors allow for a mix of instructions to be executed simultaneously as well." Fernbach said. "The potential, therefore, is greater, and as a matter of fact, you can build vector instructions into a parallel processing system so you can have the best of both worlds."

The Cray-2, scheduled for delivery this year, and the Denelcor, Inc. HEP-1, for example, employ two to four processors already, and industry analysts predict that systems with eight to 16 processors may be available by the end of the decade. This is a far cry, however, from the dream of a million processors, and the supercomputer industry continues to seek von Neumann solutions. The Cray-3, for example, scheduled for delivery in 1987, would be the first computer ever manufactured using gallium arsenide chips, which reportedly would make it five to 10 times faster than the Cray-2.

As supercomputers, which have traditionally been pigeonholed for scientific number crunching in government and scientific labs, begin to move into new market areas, the potential for these machines to play a major role in the fifth generation becomes apparent. "The supercomputer of the future will be a parallel processing system, which consists of clusters of processors, each dedicated to a certain type of activity, such as AI, numbers, graphics or a combination of a lot of things," Fernbach predicted. "This is the direction we're going in, and it's going to take a good 10 years to get there."

Developing markets

"Free enterprises and profits are not waiting for the superparallel-processing computers," stated "AI Trends," a report from DM Data consulting firm. Indeed, artificial intelligence programs are currently available for everything from personal computers to mainframes. The value of many of these programs has yet to be demonstrated on a wide scale, but the trend is clear. Vendors see a new market, and they are going after it.

> **'The supercomputer of the future will be a parallel processing system'**
>
> — ***Sid Fernbach***

Although AI-type programs can conceivably be written in a number of programming languages, the language of choice among AI professionals in the U.S. is Lisp (meaning List Processing), a 26-year-old symbolic programming language.

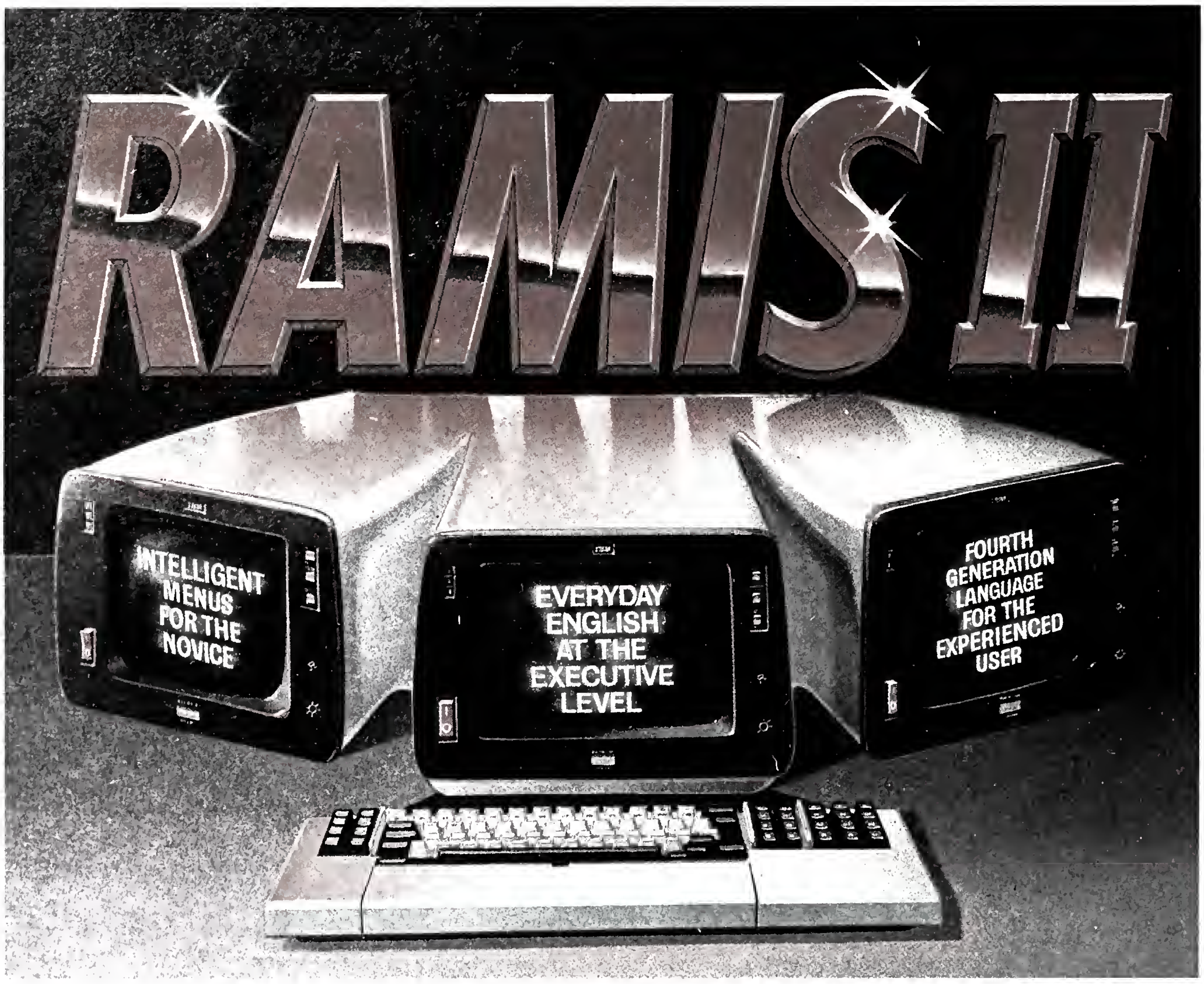
The newer Prolog language originated in Europe but is the choice of the Japanese in their push to develop fifth-generation machines. With its vast base of support and a long list of perceived advantages, however, Lisp remains the favorite in the U.S.

Among the traditional hardware architectures, the DEC VAX minicomputer is the most widely used for Lisp-based AI programs.

Personal computers have just recently entered the artificial intelligence fray and, because of the memory and power requirements of most Lisp software, have proven to be a target for the toy-like expert systems that have recently proliferated.

That, of course, will be changing radically over the next several years.

According to the Gartner Group, "the ubiquity of [personal computers], in general, is making for a market that is too large to ignore. If nothing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Supercomputer future: scenario for 1990

By Dr. Kenneth G. Wilson
Special to CW

The supercomputer scene in the U.S. should change dramatically as a result of the Supercomputer Centers program of the National Science Foundation (NSF). The NSF recently announced four awards, granted under a five-year program, to Cornell University in Ithaca, N.Y., the University of Illinois in Urbana and consortia based at Princeton University in Princeton, N.J., and the University of California at San Diego.

Today's leading supercomputers include the Cray X-MP from Cray Research, Inc.; the Cyber 205, now marketed by ETA Systems, Inc. (a Control Data Corp. spin-off), and the equally powerful Japanese machines. These machines can perform hundreds of millions of arithmetic operations per second on 64-bit words.

Wilson

Many of the changes caused by the NSF program should be manifested in five years, so the scenario for 1990 looks roughly like the following:

- Supercomputers will be predominantly parallel in organization and will be sold as upgradable networks of processors, with prices ranging from less than $100,000 for an entry-level system made up of one processor to greater than $100 million for a top-of-the-line system composed of thousands of processors.
- The supercomputer market will be valued at billions of dollars and will grow rapidly. Innumerable researchers and engineering product teams will own supercom-

See **WILSON** UPDATE/22

---

else, many users will demand that AI programs be deliverable over a [personal computer]."

In addition, micro-based expert systems using natural languages serve as demonstrators of the viability of AI technologies and "work to the aid of individual end users eager to spread the gospel within their organizations."

As microcomputers with increased capabilities, such as IBM's Personal Computer AT, appear, the number of available, useful micro-based AI applications written in Lisp will increase. Lisp requires a large amount of memory and horsepower to be effective, however, and the current choice of serious AI users remains the dedicated Lisp machine.

The major difference between dedicated Lisp machines and computers that run Lisp is that the dedicated machines have been imbedded with more than 12,000 Lisp functions in the programming environment to optimize the language.

With an appropriate interpreter, Lisp will run on other hardware but will show a corresponding loss of performance. According to Henry Firdman, a Lexington, Mass.-based AI consultant, Lisp offers highly efficient memory management, interactive programming environments, multiwindow capabilities and advanced graphics.

Burgeoning market

The market for Lisp machines is a burgeoning one, though it remains miniscule in comparison with the greater computer industry. Since the first machine — the Xerox Corp. 1100 — appeared in 1981, the market has grown to an estimated $183 million this year, according to the Gartner Group.

Estimates of the market's growth by 1990 vary widely. Find/SVP, a New York-based consulting firm, predicts a $2 billion market, while Arthur D. Little, Inc., a Cambridge, Mass.-based consulting firm foresees a $10 billion market. Firdman cautioned that a breakthrough in technology during that time period could make the projections inaccurate. "AI is currently an industry of tools, not products," he stated.

While those numbers have not spawned a flood of start-ups as in the micro software business, it has generated interest within a growing segment of the industry. Currently, the market leaders are Symbolics, Inc.; Lisp Machines, Inc.; and Xerox. Texas Instruments, Inc. has just entered

See **FIFTH** UPDATE/10

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Update

The race to the fifth generation

Does Japan have the inside track?

In October 1981, Japan's Ministry of International Trade and Industry unveiled a set of ambitious plans for its fifth-generation project. Funded to the tune of $850 million over the next decade, the fifth-generation project would trigger a quantum leap forward in computing, a leap that would land on the doorstep of the future with powerful, intelligent machines interacting with humans via natural language, graphic images and speech.

The fifth-generation announcement rocked the computing world. Japan, which had yet to assert itself dramatically in the worldwide computer marketplace and was not perceived as a particular threat to U.S. domination of the industry, suddenly loomed as a potential giant.

Six months later, the Japanese announced the formation of the Institute for New Generation Computer Technology (Icot), which would guide this massive assault on the computer age. American and European industries began to react, and several national consortia sprang up quickly to decide how to counteract the Japanese plans.

Many leaders in the computer industry and academia in America, however, were vocally skeptical about the fifth-generation project. "It's just a smoke screen" and "a major public relations effort" were comments commonly heard. The U.S. just had too much firepower, too many top minds, too much money and a company called IBM, to allow the Japanese to horn in on this valuable territory.

In March 1983, Prof. Edward A. Feigenbaum of Stanford University and Pamela McCorduck published *The Fifth Generation: Artificial Intelligence and Japan's Computer Challenge to the World.* In it, they wrote: "The Japanese have seen gold on distant hills and have begun to move out. Japanese planners view the computer industry as vital to their nation's economic future and have audaciously made it a national goal to become number one in this industry by the latter half of the 1990s.

"The consequences of complacency, of our spirited attention to the present at the expense of the long view, will be devastating to the economic health of our most important industry. The Japanese could thereby become the dominant industrial power in the world."

Among those who responded to the book was William F. Zachmann, vice-president of International Data Corp., a market research firm in Framingham, Mass. Zachmann penned his own report in which he firmly disagreed with the authors.

Computerworld Update met first with Feigenbaum and then with Zachmann and asked them each to consider once again the issue of Japan's fifth-generation project and its potential impact on the U.S. computer industry.

INTERVIEW

Edward Feigenbaum

Two years have passed since your book was published. Has anything changed in your outlook? What is the status in Japan?

In the first three years of the Icot project, my feeling is that Japanese computer science and technology closed the artificial intelligence gap. [The U.S. has] more activity, but we don't have better activity going on here. They have now understood and practiced AI enough to be state of the art throughout Icot and the industrial firms.

Basically, both countries are starting out even in the era of parallel computing for AI. We both have the same number of ideas, which is very little. They have extraordinary focus and momentum. We have extraordinary diversity and almost intentionally unfocused activity.

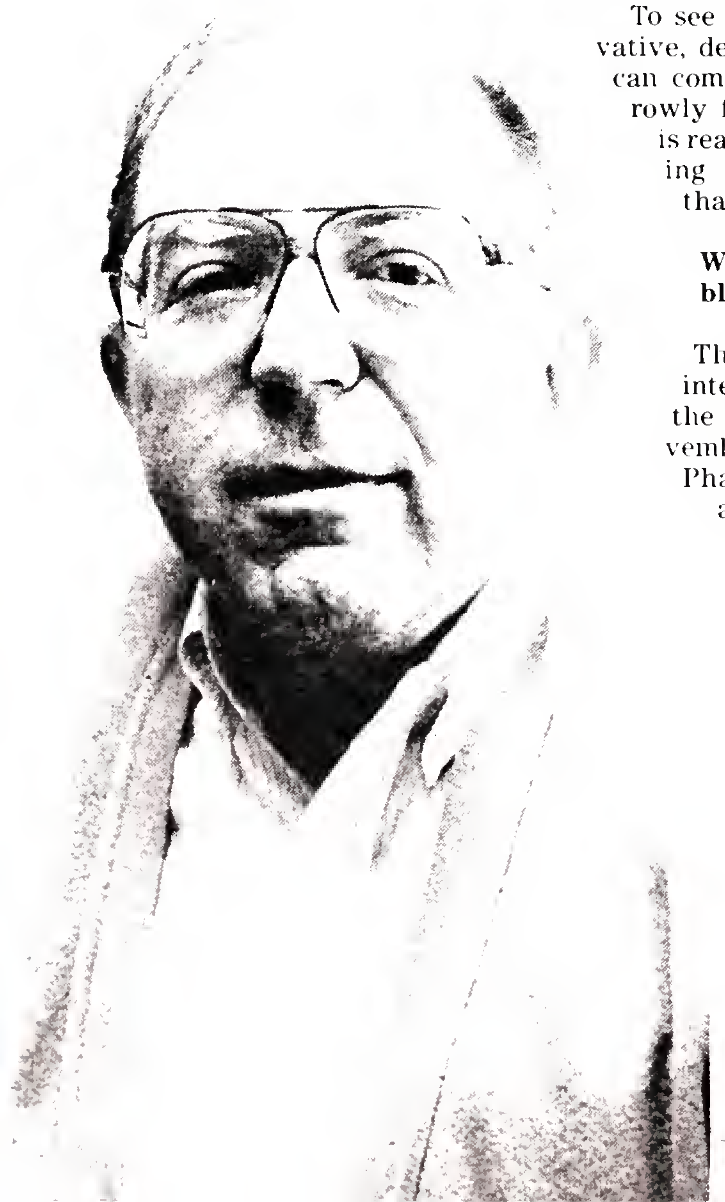
We'll see which one pays off in the next few years. Phase II [will last] four years for the Japanese. Four years is enough time to give us a good running start on parallel computing.

To see how a wide-ranging, innovative, defocused program like ours can compete with an intense, narrowly focused effort like Japan's is really one of the most interesting technology experiments that has ever been done.

What is the current timetable for Icot?

The Japanese held the second international conference on the fifth generation last November to signal the end of Phase I of the project and herald the beginning of Phase II [on April 1, 1985].

The Japanese said they were going to use the first three



'Japan has extraordinary focus. We have extraordinary diversity.'
— *Feigenbaum*

William F. Zachmann

Do you perceive a serious threat from the Japanese fifth-generation project to our place in the computing industry?

I do not think the probability is very high that the Japanese fifth-generation project will result in some major competitive advantage for the Japanese. On the other hand, I believe [artificial intelligence], expert systems and software systems that aim in one way or another to extend human mental capabilities the way a bulldozer extends human physical capabilities will unquestionably be a very important part of the future.

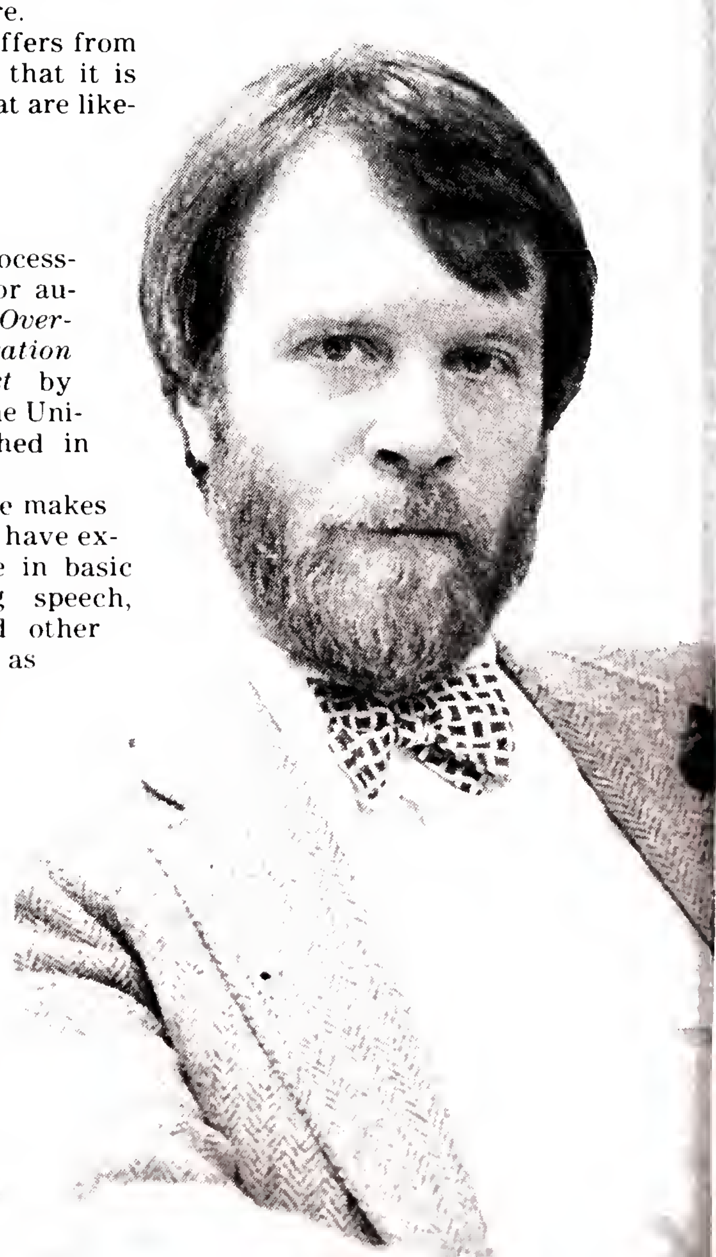
The Japanese project suffers from some serious problems in that it is based on some premises that are likely to prove incorrect.

Please explain.

The role of nonnumeric processing, for example. I rely for authority on a paper titled *Overview to the Fifth-Generation Computer System Project* by Prof. Tohru Moto-Oka of the University of Tokyo, published in 1983.

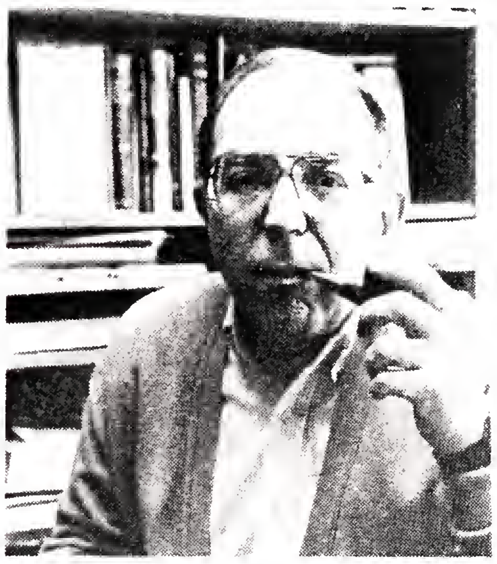
One of the statements he makes is that "current computers have extremely poor performance in basic functions for processing speech, text, graphs, images and other nonnumerical data as well as for AI-type processing such as inference association and learning."

That is the key to a very important assumption here. The assumption is that AI applications, which fifth-generation computers are supposed to support, essentially require capabilities that current computers don't have. I would take issue with that statement.



'The Japanese project suffers from some serious problems.'
— *Zachmann*

Update



Feigenbaum

years for learning, tool building and fundamental conceptualizing — in other words, as a catch-up period. That's exactly what they did.

During Phase I, they built a pair of sequential Prolog machines, one of which was state of the art in comparison with the Lisp machines available in this country. The second was far in advance of American state of the art with regards to speed. They constructed large Prolog programs and gained a tremendous amount of experience in logic programming.

They also created several interesting and complex expert systems applications using Prolog, and they began the process of disseminating the knowledge about AI languages, representation and expert systems widely throughout industry. They now have an extended family of industrial people working on Icot projects that numbers in the neighborhood of 200 to 300 trained individuals.

The core group of people, which was originally 40, is now 48 and will climb to 100 in Phase II. So there are three rings of people for Phase II: 100 for the inner group, 1,000 in the Icot extended family and about 10,000 people in the whole industrial picture, including Icot. That's a massive training effort. The Japanese, no matter what they achieve in Phases II and III, will have built themselves an enormous infrastructure of educated, well-trained people in symbolic computation and AI.

How has the U.S. responded to this?

Since the book came out, some very positive things have happened in this country and Europe. There's a broad recognition of the importance of the symbolic manipulation technologies including AI and its associated machines. Darpa [Defense Advanced Research Projects Agency] launched its huge strategic computing project, which is primarily focused on high-speed symbolic computation. The industrial firms in the U.S. have picked up interest in the field to an astonishing degree. And that's one place where we differ from the Japanese.

The Japanese have a deep industrial interest, but it runs narrow and deep in a few companies. We have a very broad industrial interest.

To the extent that I am able to see into the industrial picture, I am astonished at the range of AI going on here. It's really breathtaking how many companies are establishing groups and training themselves.

Yet you continue to be concerned about AI growth?

The primary danger to these activities in the U.S. and Europe is defocusing. The Japanese project is focused on AI and its applications. The programs in the West are broad-ranging programs, except for Darpa.

The Japanese normally handle things by multiple national projects. The fifth-generation is just one project along a wide frontier, whereas the Western projects tend to cover everything with one project.

Because the Darpa project is funded by the U.S. Defense Department and must be mission-oriented, [a lot] of the strategic computing money will be spent for military-oriented test beds. The Japanese do not have to shoulder that defense burden.

Critics of your work tend to feel that we are so strong, even in unfocused ways, that we will not lose to the Japanese in the long run.

Ten years is a long time, and small gains per year can compound into significant shifts of position. In 1972, the Japanese had not produced a single commercial chip when they launched their national semiconductor activity. In 1982, they had 60% of the world's market for 64K-byte RAMs [random-access memories]. They are capable of moving very rapidly, and in my view, they are moving into an area which [has] the maximum growth potential for the information processing industry.

'Some very positive things have happened in this country and Europe. There's a broad recognition of the importance of the symbolic manipulation technologies.'

— Feigenbaum

There is still a vast unoccupied territory in that universe, and that is the territory occupied by symbolic processing applications, particularly those which we know of as AI. That's a very important area in which to occupy territory, and that's what the Japanese are intending to do.

Is this the greatest obstacle to our own fifth-generation push — the unwillingness to team up for focused national effort?

Obstacle is the wrong terminology. You have to call these things "national characteristics." We have national characteristics of independence — the desire to push along our own track rather than to be focused into someone else's track.

Are you encouraged in any way about changes in our efforts or are we as individualistic as ever?

We are as individualistic as ever. There's no change in the spirit of cooperation, none whatsoever. The encouragement has been in the breadth of response — but not in the cooperative nature of that response.

Zachmann

There is no question that current computers do just fine processing speech, text, graphics, images and other nonnumerical data. I see no real reason to conclude that current computers are inadequate for AI applications or nonnumeric processing.

What about the search for these super, high-powered computers?

It is not sustainable by the facts to claim that somehow there are these AI, Prolog-type, brute-force inference engine applications just waiting for bigger, more powerful computers. If there were such applications, they could run on existing computers.

In fact, the obstacle to those AI applications is not hardware at all. It's partly that the imagination that has been used in building those kinds of systems is as yet insufficient. It's partly that the model is incorrect.

What will make the important things happen?

If you approach it from the purely formal point of view, which is what logicians and academicians tend to do, then it seems that if you only had this super-fast engine, it would solve all the problems of the world.

In fact, that's not the case. There is lots of hardware available to run Prolog or anything else you want to run. The real obstacle is that the AI software has not been intelligently enough written yet.

What are the obstacles to software being written?

One of the things we're going to find when we get more seriously into the concept of expert systems is that the expertise just isn't there. One of the phenomena of human life generally is that you and I can decide we're experts on something or other. I say you're an expert, and you say I'm an expert. We talk a lot of mumbo jumbo, and nobody knows the difference.

Most of the social sciences have that characteristic. Psychology, sociology, economics are, in fact, an enormous mass of mumbo jumbo. The idea that there's all this knowledge just laying around waiting to be put into computer systems is not so.

What about the assumption that AI and knowledge-based systems will typically be large and complex?

That assumption is also incorrect. While there certainly is a class of AI applications that may require complex inference engines, the most important AI applications will run on personal computers.

A lot of people in the industry still view this as a race between the U.S. and Japan. The Japanese are pouring a lot of money and effort into this focused effort. Is their effort not to be taken seriously?

There is no question that the fifth-generation project has been a very effective public relations effort for the Japanese. It has given the sense that they are very leading edge and looking to the future. They've certainly had the support of a number of American and European academics in sustaining that particular illusion. The idea that this is going to give the Japanese an objective leg up on the rest of the world is not sustainable by the facts.

There very well may be some useful things that result. However, I don't think they will have the breadth of reality-level impact that is implied. The amount of money is not that huge. If you compare it with IBM's [research and development] budget, it's a drop in the bucket.

There are a lot of people in Japan who obviously know better. In fact, my understanding [is] that the second round of [funding] for the project was by no means enthusiastically supported by all of the people involved.

'You and I can decide we're experts. I say you're an expert, and you say I'm an expert. We talk a lot of mumbo jumbo, and nobody knows the difference.'

— Zachmann

One of Prof. Feigenbaum's major points is that it is characteristic of the way the Japanese attack these problems to come at them with a very focused, cohesive approach. Americans, on the other hand, characteristically take a much more individualistic approach — everyone essentially doing their own thing.

Prof. Feigenbaum is incorrect if he maintains there is a radical difference between the U.S. and Japan in that regard. Dedicated, focused effort toward achieving objectives is certainly as much a characteristic of U.S. companies as it is of Japanese companies.

Do you feel that fifth-generation-type work is so far ahead or blue-sky that it is missing the point?

It's not even that they are so far ahead; it's that they are [going] in the wrong direction. [It's like] the old Islamic saying, "I fear you will never get to Mecca, my friend, for you are on the road to Kandahar." Calling that approach "too far ahead" gives it more credit than it deserves. It's not too far ahead; it's just silly. It's not relevant to the much wider range of real-world problems.

FIFTH

from UPDATE/7

the market with its Explorer machine after several years of extensive AI research, and Sperry Corp. has signed an agreement with TI to build a Lisp processor that will be integrated into Sperry's product line.

The current state of the art is, indeed, limited by power and memory requirements of computers as well as the need for breakthrough-type algorithms to transfer more subtle aspects of human reasoning and intelligence to computers.

Industry analysts predict that over the next few years, Lisp machines will move from their current installed base in universities and U.S. Department of Defense facilities to private industry. This movement is being led by Xerox, which wants to use its other businesses to help bring AI into such new areas as the office marketplace.

Expert systems are the closest we can get to cloning. We capture the expertise of a good production manager. We distribute copies of the rules to spread the expertise around.

Xerox approach differs

Unlike Symbolics, which sells its high-powered, single-user systems, considered the Cadillacs of the industry, at a premium price, starting at $60,000 and going up to a fully configured $150,000, Xerox is trying a different approach with the technology it has been developing since 1970 at its Palo Alto (Calif.) Research Center. Its 1108 Lisp machine sells for $21,950 in base configuration.

"Our desire is to get the AI applications revolution under way and get AI into the day-to-day operations of the Fortune 100," explained Beau Sheil, manager of product development for Xerox's AI Systems Business Unit.

According to Sheil, all the major vendors will soon offer some kind of support for AI. "It's a niche market, but as visibility grows, I expect everybody to be in there," he stated.

Software expert systems

In the drive toward the fifth generation, the first shining star has been the expert system. Although it has been the subject of much criticism — called "empty mimicry" by *Fortune* magazine — the expert system has its origins in AI research, and if it remains a giant step away from true human intellect, it is already serving as a bridge into the revolution.

Expert and knowledge-based systems are rule-based (IF-THEN) computer software programs that can be used to model complex problems and solutions. The expert system derives its knowledge from a living expert in a particular field, and the knowledge-based system draws from books, reports and other nonhuman resources.

The components of an expert system are simple: The human expert is debriefed by a knowledge engineer — a new profession born out of this research. It is the knowledge engineer who creates a data base of facts and inference rules — incorporating into this as much human subtlety as possible.

These rules are then processed through a decision-making computer program, called an inference engine, using either backward chaining (working backward from the conclusion to the facts needed to support that conclusion) or forward chaining (gathering facts to reach a conclusion).

The results are generally distilled through a natural-language front end or interface. Users of the system can then interact in English-language commands with what is now a sophisticated expert assistant.

Closest to cloning

"Expert systems are the closest we can get to cloning," said Richard E. Morley and William A. Taylor of Gould, Inc. in a report on expert systems.

"We capture the expertise of a good production manager. We distribute copies of the rules to spread the expertise around. We no longer fly our expert all over the place."

Expert systems have been used with success in the fields of medicine and geology and in the military. The key to success with these systems is closely tied to the degree of difficulty of the problem to be solved. If the problem is too broad and the scope too vast, the expert system of today will likely fail.

John McDermott, principal scientist in the computer science program at Carnegie-Mellon University in Pittsburgh, has developed a number of highly successful expert systems, most notably the Xcon system for Digital Equipment Corp., which configures its VAX minicomputers to fit individual customer needs. Xcon reportedly saves millions of dollars annually for DEC.

"I've been fairly fortunate in picking problems that are the right size, given the state of the technology," McDermott said. "The problem is that if you pick things that are too easy, people laugh. If you pick things that are too hard, then you fail. Get-

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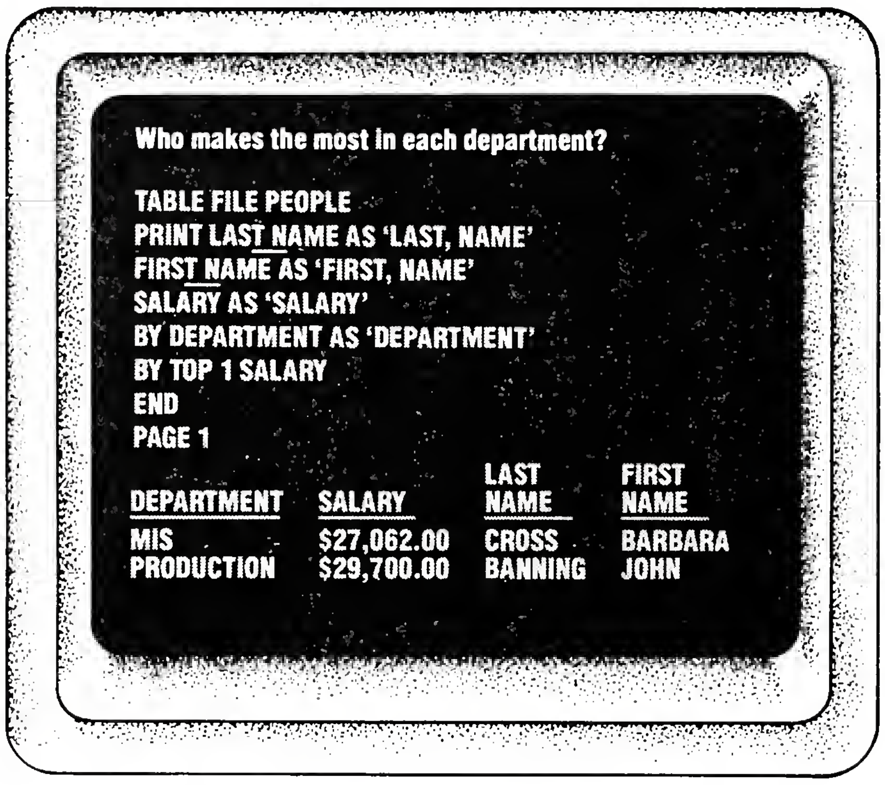

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DEPARTMENT   SALARY       NAME      NAME
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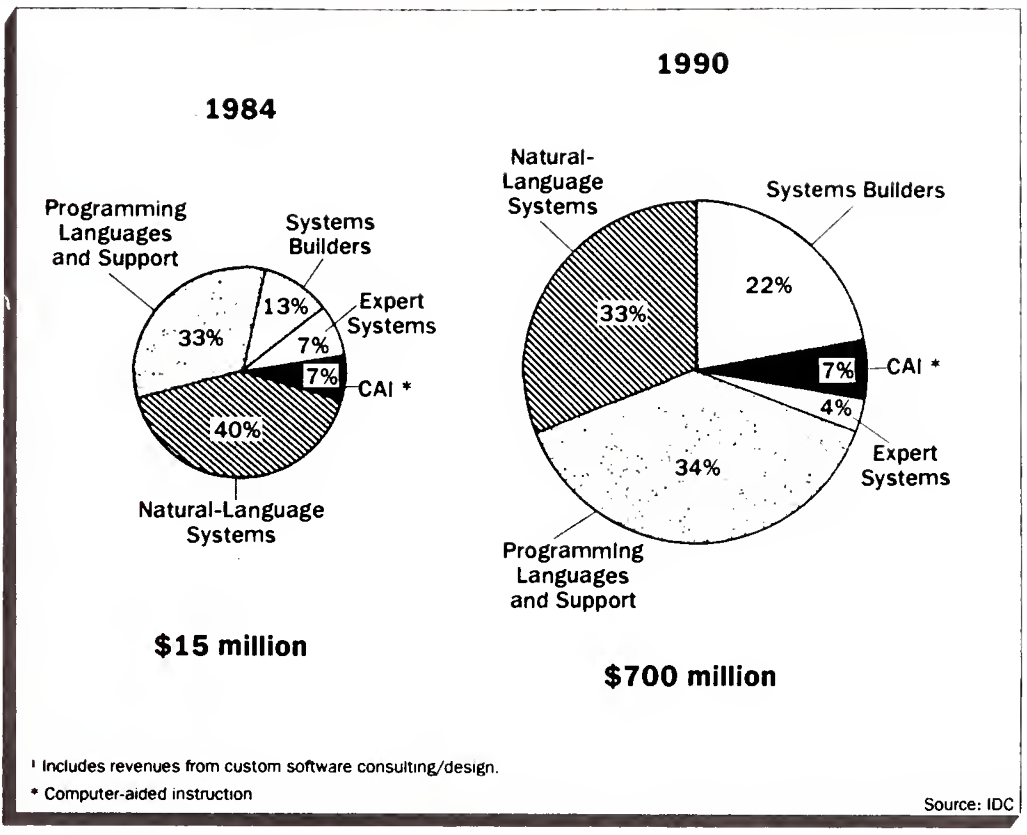
Update

CW CHART

HOW AI SOFTWARE MARKETS WILL GROW
(Worldwide revenues of U.S: Suppliers,[1] Dollars in millions)



[1] Includes revenues from custom software consulting/design.
* Computer-aided instruction

Source: IDC

ting the right size problem that can be successfully solved with the current state-of-the-art technology is key."

The current state-of-the art is, indeed, limited by power and memory requirements of computers as well as the need for breakthrough-type algorithms to transfer more subtle aspects of human reasoning and intelligence to computers.

The "intelligence" of expert systems has been called into question. Critics claim that existing expert systems have no more connection to intelligence than many conventional computer programs, and that the mechanical meanderings of a computer can hardly compare to the "rich associations, metaphors and generalizations that language evokes in people and that constitute the essence of meaning and thought," according to *Fortune* magazine.

Karl Wiig, director of Al at Arthur D. Little, Inc. (ADL) in Cambridge, Mass., admitted that a number of expert systems are overrated. He cautioned that people may have misconceptions or false expectations of the difficulty of creating a good expert system.

"Some people feel cheated because they expect systems to live up to a lot of overinflated expectations," Wiig explained. "What they have to understand is the cost of building these systems is much higher than, say, building a decision support system for the same purpose.

"You are not dealing with a human who learns relatively easily. You are dealing with a machine that must be spoon-fed. As a result, the cost of being sufficiently explicit on a subject is going to be very high."

Consultant Henry Firdman said there are additional obstacles to creating broadly useful expert systems. Knowledge engineering, for example, is labor-intensive, expensive and requires skills that are in short supply. In addition, current hardware and software tools are expensive and difficult to learn to operate. And finally, there is resistance among experts whose turf is threatened. "People don't like to be replaced," Firdman said.

Thus, two camps have been set up under the expert systems umbrella. There are those, primarily in academic research environments, who are mainly interested in the potential of transferring human intelligence to machines. Others, particularly in industry, take a more practical view.

"I see the development of systems that are very narrow and specialized and can provide expertise in a very limited area," Sheil of Xerox said. "They must leverage a fairly consequential professional, like the petroleum geologist [for whom] Schlumberger Ltd. built its expert system [called Dipmeter Advisor]. There you have a small number of people in a very specialized field who make decisions that have millions of dollars [hanging] on them. You can justify systems that help them make small adjustments in the quality or speed of those decisions. AI is particularly well suited to those types [of] things because it is a depth rather than a breadth of knowledge," Sheil said.

"The academics are trying to understand intelligence," added Arnold Kraft of DEC's AI group. "We're more pragmatic. We say, 'Here's another set of nifty tools to help you solve problems.' "

At DEC, the widespread use of Xcon has had an extremely positive effect beyond the money saved on VAX configuration. According to Kraft, the company is moving at full speed into further Al research with more than 200 people devoted to research and development work in that area. "Our goal is to take the abilities of our best people and make them available to other people; generally upgrade everyone's capabilities," Kraft said. "The result of that is the people who are very good get to go on to yet harder problems, and the [drudgery] is gone for them. The others actually learn through the program, which is like the eyes and ears of the expert."

Industry is getting heavily involved in expert systems research. It is estimated that more than 200 of the Fortune 500 companies have set up internal AI research groups, although some efforts are considerably more substantial than others. Such giants as General Motors Corp., General Electric Co., Martin Marietta Data Systems, Inc., Lockheed Aircraft Corp., Hughes Aircraft Co., TRW Corp. and United Technologies Communications Co. all have major AI projects under way, and ADL predicts that corporate and government spending for AI will reach $1.25 billion annually by 1990.

For the market to explode as predicted, however, the applications emphasis for expert systems must make a dramatic shift away from the one-of-a-kind geological, medical and military applications of the past and move toward more commercially oriented areas of business/financial decision making, equipment diagnostics and maintenance and manufacturing planning. For large vendors first entering the AI business, it is a matter of shaping internal thinking.

At Hewlett-Packard Co., Ira P. Goldstein of the Computer Research Center is leading a major effort to bring Al and expert systems to HP's desktop line of computers. Although he would not reveal specific product offerings, Goldstein said that the first such products would be available in 1985. For HP, there is a natural expert systems connection between its computing and scientific diagnostic equipment, according to Goldstein, and in fact, the company already has an early expert system available for its electrocardiographs.

HP, however, wants to expand its use of expert systems deeply into the software development, manufacturing and office technology areas. For Goldstein, the technology questions are eclipsed by a larger issue. "One of the largest problems you face is how to transmit the culture in order to shift the paradigms. How do I train the several thousand software engineers at HP to be conversant [with] this technology?"

While the large companies grapple with this, the concept of bringing expert systems to a mass audience has created what many believe is the leading business opportunity in the field: expert systems development tools. These development tools are generally shells, or the framework of an existing expert system with its specific knowledge base removed.

The first such shell was Emycin, developed at Stanford University, which was the inference engine and knowledge-base management system for Mycin, an early expert system also developed at Stanford and used in medical diagnosis. Since then, a spate of start-up firms, many with university ties, has emerged to sell these development tools.

Among the early competitors are Teknowledge, Inc., General Research Corp., Smart Systems, Inc., Inference Corp., Software A&E and Intellicorp. Such major firms as Xerox, McDonnell Douglas Automation Co. and Tymshare Corp. also offer such tools while others such as DEC, Data General Corp., Texas Instruments, Inc. and IBM are said to be working on versions for their customers.

The field of expert systems tool development will grow at a rate of 60% per year soon, according to Frederick Hayes-Roth, chief scientist for Teknowledge, a market-leading, four-year-old Palo Alto, Calif.-based firm. GM spent $3 million to acquire an 11% equity in Teknowledge in 1984, signaling the beginning of a strategic business relationship between the two companies.

"In five to 10 years, expert systems will be everywhere," Hayes-Roth said. "Whether you know you are dealing with one or not, I'm uncertain. Some people use expert systems and Al to configure products for their customers, but they don't tell them they are using Al. Some customers are simply not ready for it, and in some cases, the company doesn't want its competitors to know it is using AI."

The costs of doing an application using an off-the-shelf tool, such as Teknowledge's S.1 or M.1 packages, are going down so dramatically that the number of applications is increasing tremendously, Hayes-Roth said.

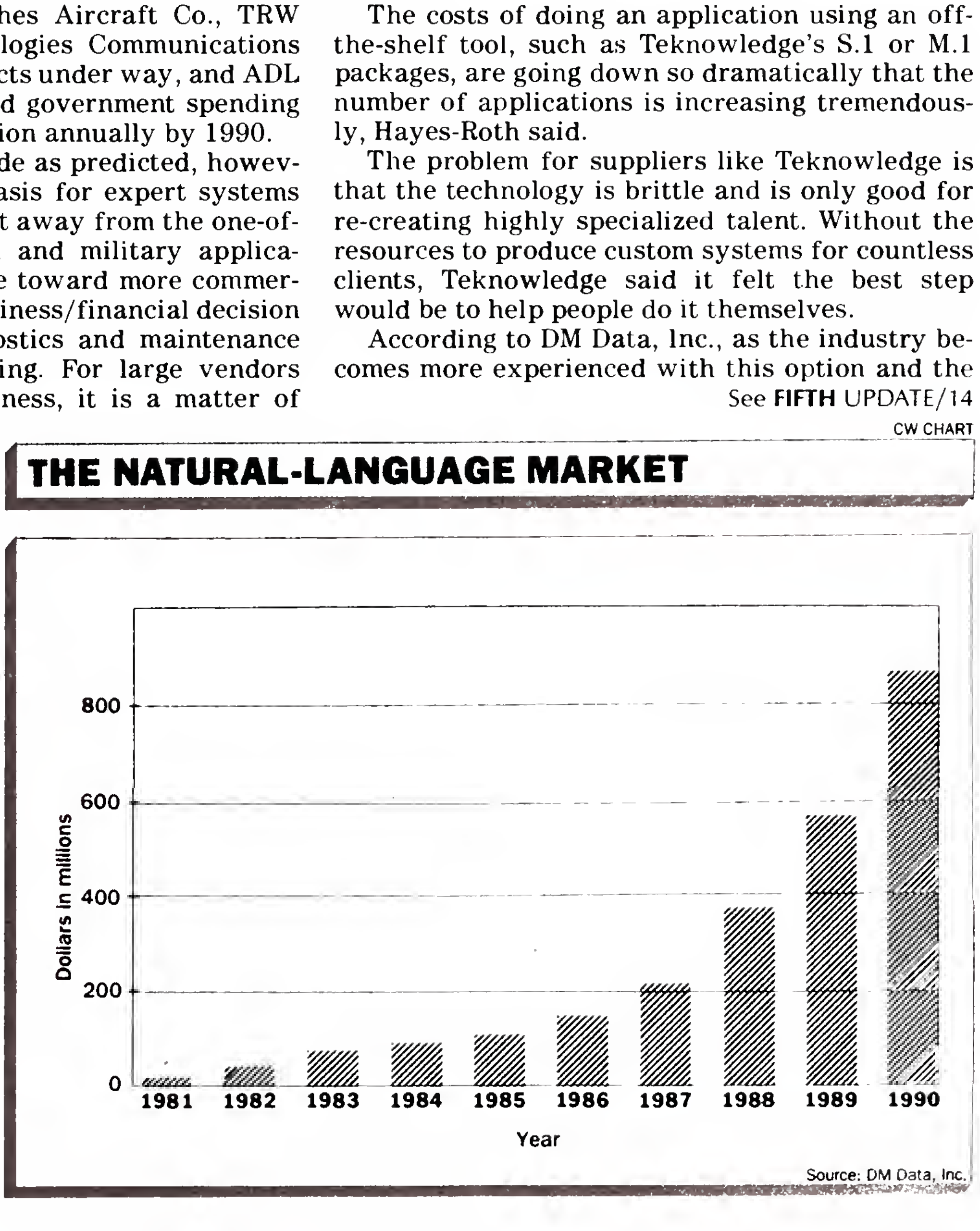
The problem for suppliers like Teknowledge is that the technology is brittle and is only good for re-creating highly specialized talent. Without the resources to produce custom systems for countless clients, Teknowledge said it felt the best step would be to help people do it themselves.

According to DM Data, Inc., as the industry becomes more experienced with this option and the

See **FIFTH** UPDATE/14

CW CHART

THE NATURAL-LANGUAGE MARKET



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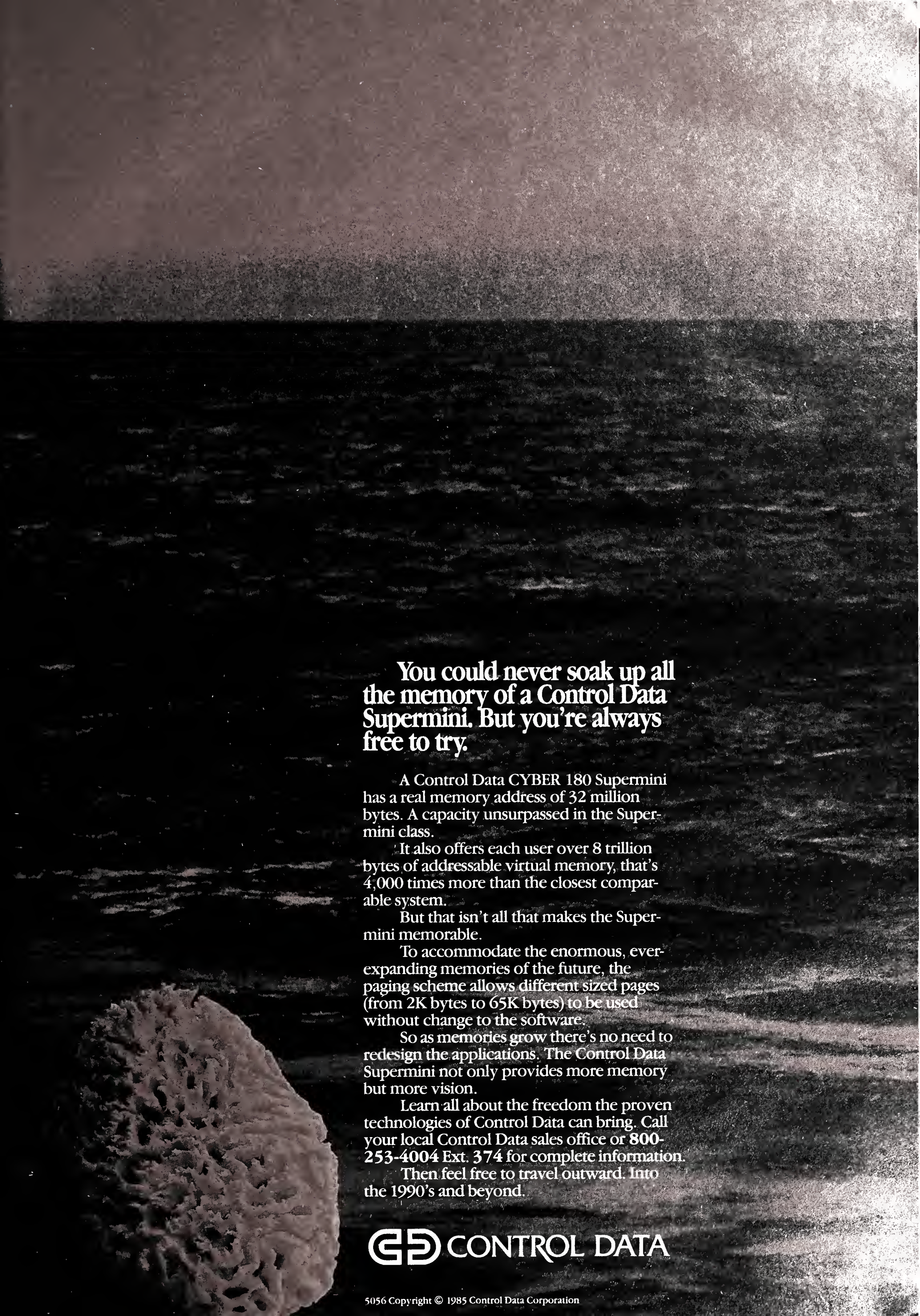

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FIFTH

from UPDATE/11

documentation improves, this do-it-yourself approach to creating expert systems will increase dramatically because of cost-effectiveness and increased security on systems. The consulting firm predicted that these framework systems will account for more than half the market by 1988.

"Within the next few years, some knowledge acquisition tools will be developed that will make it possible for people with only modest amounts of AI experience to develop first-rate systems in a handful of domains," Carnegie-Mellon's McDermott predicted. "With that, we'll see a jump in the number of expert systems out there."

Despite the growing excitement about this budding industry, those within the field are keeping the technology in perspective.

"Will it change our lives in five to 10 years?" Hayes-Roth asked. "I doubt it. The computer didn't change our lives in five to 10 years, and this won't either. It will make a lot of companies a lot of money in that time, however."

"There's nothing special about expert systems now," McDermott added. "As increasingly powerful techniques are discovered, however, they will be exploited in applications programs so that through an evolutionary process, in 20 or 30 years, we'll have some truly impressive machines."

Hayes-Roth

For the DP professional, the impact of expert systems will be long in coming, according to ADL's Wiig. "Cobol will stay around for a long, long time," he said. In addition, the majority of uses for AI tend to be focused on the management of knowledge within the organization — dealing with professional content and the organization of professional activities — rather than with actual implementation or writing code.

In the future, however, expert systems will have such an effect on how an organization does business "that it will require a totally different alignment of what you think of the DP professional," Wiig pointed out. "I know of many DP managers who had difficulties adapting to the general concept of management information systems when that concept came about. They wanted to continue to operate the computer center and were not very interested in changing the concept to supporting management within the organization. With this, we are dealing with a much more drastic revolution."

Need for natural language

Undoubtedly, computer scientists of the future will look back at current expert systems as crude and simple forerunners to offerings today's users can only imagine. Among the key obstacles to reaching the next generation is the task of implementing cognitive understanding on a machine. With all the advances to date, a computer is still only capable of understanding what is programmed into it.

Creating a natural-language interface for the computer is the first step in that complicated process. From overexposure to science fiction movies and literature, computer neophytes have come to expect that systems understand everyday English commands.

In fact, natural-language understanding is in an embryonic state, and getting a computer to comprehend the broad and complicated nuances of syntax and semantics has not yet come very far. How, for example, does the computer differentiate between "Time flies like an arrow," and "Fruit flies like an apple?" According to Firdman, "Out of sight, out of mind" was translated into "an invisible maniac" by a computer.

Cognitive science, a field that combines computer science and cognitive psychology, has attempted to quantify natural-language understanding, but it is like peeling an artichoke: The more layers you peel away, the more it seems there is to get through. For the use of computers to reach a maximum audience, particularly in business settings, natural-language interfaces must allow access to data bases, decision support systems, spreadsheets and the like without the intimidation of computerese.

Roger Schank, professor of computer science and psychology at Yale University, has been a pioneer in natural-language understanding. After more than a decade of research in the field, Schank has become less convinced of the immediate payoffs of AI. Speaking at a recent workshop of the Information Industry Association at Hyannis, Mass., Schank pointed out that AI is no more available today than it was 10 years ago. "AI has as its goal something so complicated and so difficult that it will never be here," he stated. "By that I don't mean that AI is impossible. I just mean there will always be more to do."

Natural-language understanding, according to Schank, presents some fundamental problems. "The problem

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AI technology: Implications for DP

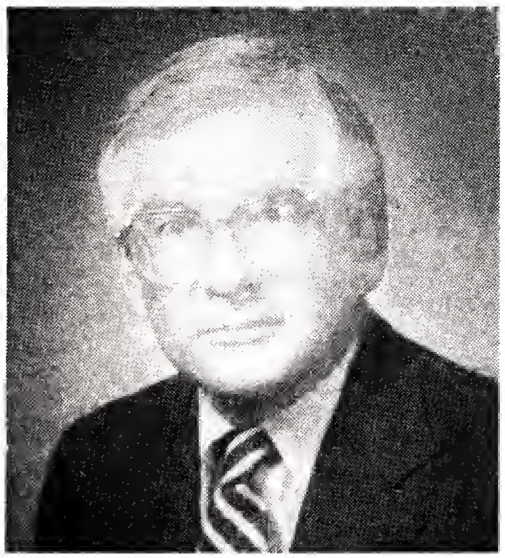
By Howard Dicken
Special to CW

Businesses soon will be able to obtain the decision-making skills of a Fortune 500 manager or a $1,000/day consultant by creating an artificial intelligence expert-system software program. How will this and the other subtle aspects of AI affect the data processing manager? With the AI industry just now emerging from the university laboratories and AI products becoming commercially available, the capabilities and potential of AI products are now very real.

AI can be considered as the application of computers to the process of learning and understanding from experience, acquiring and retaining knowledge and responding quickly and successfully to a new situation.

Unfortunately, this definition does not resolve the fundamental problem of obtaining a consistent and complete definition of the word "intelligence." The basic answer, however, is that the capability of AI allows a computer to make human-like decisions.

With a few exceptions, the initial AI products will be in the form of software or software packaged with customized computer hardware, such as the following:


Dicken

■ Expert systems — software programs that attempt to duplicate the decision-making process of human experts in a given field, such as geology, medicine, engineering and science.

■ Natural language software — programs that allow the user to query the computer and access data in a conversational style as opposed to specific computer commands.

■ Visual recognition — software programs and hardware being developed primarily for applications associated with inspection and robotics, allowing a system to discern particular objects, shapes or components.

■ Voice recognition — hardware and software programs designed to analyze the sound and identify each spoken word.

■ AI computers — hardware that is specifically designed for AI software and applications; usually symbolic processing.

All of these areas will have some impact on present DP activities. For example, advances in voice and visual recognition and AI computers will start to affect hardware acquisition decisions in the next few years. We now have the possibility of seeing limited-range, voice-activated typewriters by 1986. The major technical impacts, however, will be in the areas of expert systems and natural languages.

A primary growth factor for AI in the next one or two years will be the availability of framework expert systems and the realization within the user community of the need for this technology. In some companies this capability has already bypassed the DP department. In one case, the capability of expert system development originated in the research and development department and was transferred directly to engineering — completely circumventing the DP department. With natural language, anyone will be capable of accessing a data base — if allowed.

What are the factors that will affect the data processing manager? The changes will range from none to complete reorganization. The potential changes for a company will range from the technical to the management level and even to social aspects. In the extreme case there will be no need for a DP department and the support specialist. This is most likely to occur in new companies without an established DP department.

With the present trends to powerful desktop computers, natural language interfaces and the resultant "distributed processing" data base management, data analysis (spreadsheets) and even word processing can be and are currently performed by individuals in smaller companies.

A natural language interface to a data base allows entry and use without requiring any programming knowledge. For some current products, very little computer operation experience is necessary beyond finding the "on" switch and the ability to read commands on the screen.

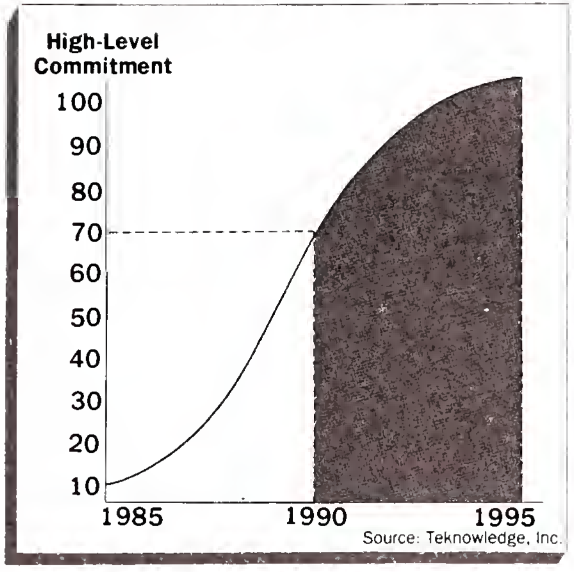
Even the word processing department will not be required. Today, with a combination of new word processing programs, spelling checkers and form checkers (an IBM program), even an engineer can turn out an acceptable letter. This will be even easier in about two years when commercially viable voice-activated word processing computers become available.

More likely than the demise of the DP department is the trend toward self-programming. AI software, including both expert systems and natural language, will allow the user to customize the programs to obtain the proper data and desired report forms. Expert systems, once they are developed, can provide information to any inexperienced operator. The results will be, if not the elimination of a staff of specialized programmers and computer experts, then a major shift in the type of skill required.

In a few years, the DP department in a progressive company will not be advertising for Cobol or Fortran programmers. If a programmer is required at all, the language requirements will most likely be Prolog, Lisp and object-oriented languages such as Smalltalk. The most needed (and marketable) individual will be a "knowledge engineer," a specialist who has the ability to translate an expert's knowledge into an expert system. These people are already commanding salaries of $60,000 to $90,000 — if a good engineer can be found. As with computer programmers of 20 years ago, there will be a major but temporary shortage in most of the AI skill areas.

HOW FORTUNE 500 COMPANIES WILL RESPOND TO AI

CW CHART



Source: Teknowledge, Inc.

Assuming some or most of the potential trends discussed above come to pass, the major management problem with the advent of AI will be one of control. With the combination of distributed processing, natural-language data bases (which anyone can technically access) and self-created expert systems, information control will be a key management factor. Control of security, accuracy and amount of system use all will be equally important.

Problem of system overload

The ability of AI software to allow any individual to access and manipulate data bases or other files introduces the potential problem of system overload. In fact, this has already happened in some initial installations of natural-language data bases. The users who are amazed at the ability to obtain "instant information" instead of waiting in queues for weeks at the DP department start to exercise the system by requesting more information and performing "what-if" types of analysis. The result is search requests that have taken hours of CPU time, completely tying up the system. The potential of unrestricted use by any employee is almost sure to create a "traffic jam." The amount and cost of equipment required to accommodate the uncontrolled load would increase dramatically.

Even without uncontrolled use, the amount of computer equipment will increase. AI programs typically require two to 10 times more dynamic memory to provide the operating intelligence. Most computers dedicated to AI software are 32-bit machines with extended memory capabilities. Lucky for the department's budget, however, is the decreasing cost trend of computers and memory of over 30% per year. This does mean, however, that present equipment becomes technically obsolete in less than five years.

AI programs, including the natural-language data bases and expert systems, can be less accurate than those currently running. For the DP department and the user management personnel who are accustomed to reporting data to "x" decimal-place accuracy, AI programs will require some rethinking. For example, a good expert system is designed to give "fuzzy" answers. The answers are actually weighted in terms of probability based on the confidence of the input information.

Natural-language data bases introduce the same possibility of error as requesting the information from a human. There is the same problem of the correct interpretation of the request or question. For example, take the following conversation with a data base:

Human: Give me the value of PX Computer Sales in New York.

Computer: Do you mean annual sales?

Human: Yes.

Computer: $10 million.

Human: OK, that's all.

This information could be completely inaccurate if the user was thinking of New York City when the question was asked and if the natural-language data base had been trained to respond to recognize states. Normally, a good AI program is designed to identify possible misinterpretations, but as the programs become more human-like and are expected to respond as such, the same type of errors can occur.

One industry observer suggested the possibility of stagnation within the DP department. With all of the "artificial" intelligence, the departments will not have to do anything. We assume that this will not be true.

The bottom line is that the DP manager will have to do more managing. With the capabilities of AI onboard, the DP manager will have fewer programming and technical problems but will have more problems of resource allocation, data control, security, equipment selection, program selection, budgets and personnel acquisition.

Dicken is the president of DM Data, Inc., a Scottsdale, Ariz., consulting firm that specializes in artificial intelligence.

FIFTH

from UPDATE 14

of language is not language. It's what is behind it," he explained. "It is the inference problem. The inference problem is caused by the fact that what we say is only the tip of what we are really thinking and thus trying to express. The problem is [deciding] how are you going to teach all this stuff to a computer."

Despite the enormity, and perhaps impossibility, of this task, the market for natural-language software is growing. According to DM Data, when combined as front ends for expert systems, this software is projected to be the fastest growth area of the AI market, increasing at a compound rate of more than 75% per year. By 1990, the company predicts nearly a $1 billion marketplace.

Natural-language front ends currently exist for personal computers, minis and mainframes and generally focus on two uses: data base query and software integration. Products range in price from $400 for IBM Personal Computers and up to $50,000 for minicomputers. The best-known success story in the natural-language business to date is Waltham, Mass.-based Artificial Intelligence Corp.'s (AIC) Intellect product, a software interface-to-mainframe data base management system.

The company was founded in 1975 by Larry Harris, but the product did not appear until 1981. Written not in Lisp but in PL/1, Intellect runs under DOS/VSE, MVS and VM environments and sells for between $50,000 and $70,000. Intellect has been picked up by such software manufacturers as Cullinet Software, Inc. and Information Science, Inc., and in 1983 was given the stamp of approval from IBM.

Other major players include Cognitive Systems, Inc. (of which Schank is chairman), Frey Associates, Inc., Microrim, Inc., Mathematica Products Group, Inc. and TI. According to the Gartner Group, however, none of these products approaches a human understanding of English. All have limitations and will not accept just any free-form query. This generation of products is also not portable, as the lexicons that are built in are intimately tied to the underlying data bases.

Goldstein

Today's offerings use such techniques as "fuzzy set" theories, which allow the computer to make a satisfactory decision as opposed to no decision at all, forgiving misspelled words and responding with the nearest equivalent.

Heuristics are incorporated into the technology to offset what AI researchers call "combinatorial explosion," a state in which the number of possible alternatives is so enormous that a computer simply cannot handle it — as in chess, for example, where there are approximately 10 to the 120th power legal moves. So programmers build in rules of thumb based on experience to cut down the number of alternatives.

At Yale and at such companies as Cognitive Systems, work is being done on translation methods to well-known software packages.

Although the first uncertain steps are being taken in cognitive understanding, it is clear that at least a decade separates today's user from the breakthrough technology required for high levels of natural-language understanding. Work in the research laboratories of universities tends to precede commercial product cycles by 10 years and the next generation of understanding is only now getting under way in academia.

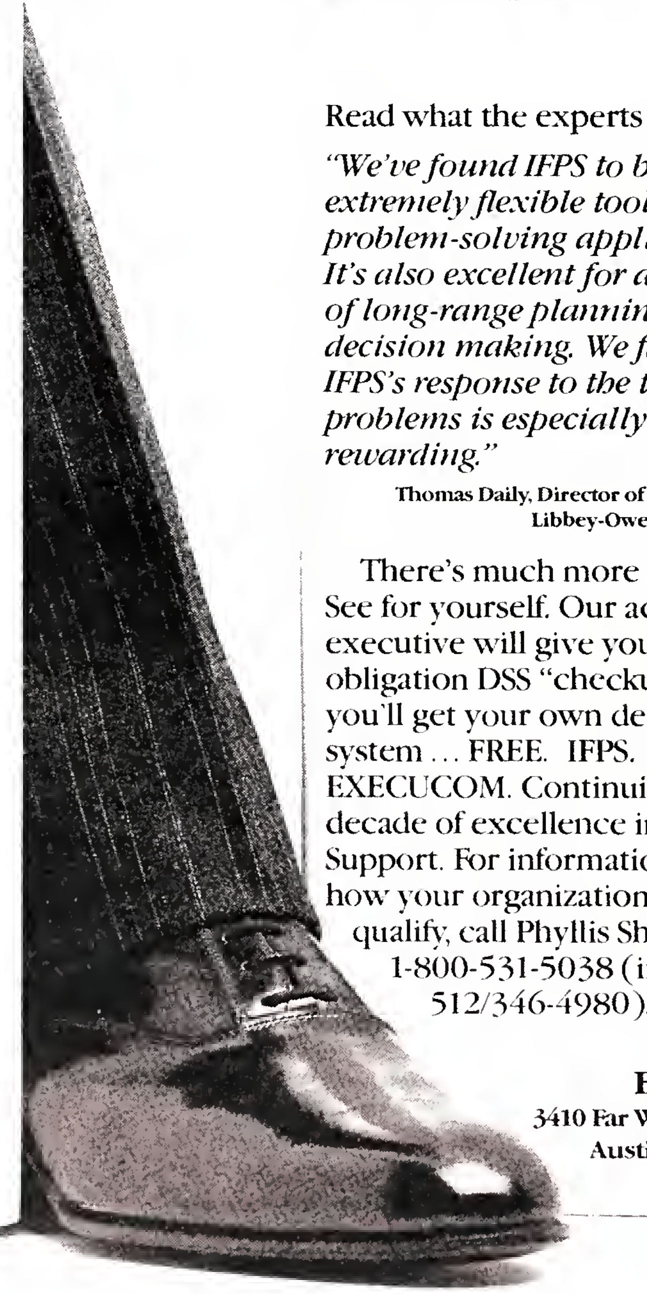
As Schank explained, "We in the field of AI will continue to have, as we work on the problem, spin-offs that relate to people in the information industry to make their lives easier. A great many interesting things will happen. But don't lose sight of the fact that, in general, AI is about understanding intelligence. And we aren't quite there yet."

IBM: Leader or follower?

Unlike in virtually any other segment of the computer industry, the name IBM is not frequently heard in discussions of artificial intelligence. For a long time, IBM was considered in many circles to be anti-AI, a reputation gained by its seeming indifference to the study of this new technology.

But as the world's largest computer company, with an annual research and development budget of $4 billion — more than most other computer makers' annual revenues — this giant powerhouse must be viewed as vital to the interests of any emerging field. Indeed, many in the industry said they believe that to hold off a major challenge from the Japanese in the next decade, IBM must spearhead U.S. efforts in the fifth generation.

Ironically, IBM is viewed as anything but innovative. According to Feigenbaum, IBM has historically taken a backseat in major development work. "One might look to DEC for innovation, but I don't remember looking to IBM for innovations in time-sharing or innovative architectures or anything across the board," Feigenbaum stated. "I look for IBM to



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do something significant later, once it [is] proven that it is a viable technology." Added a report from the Gartner Group, "IBM often leaves the spadework, such as market education and development, to others and then muscles its way up to the bar."

In fact, IBM has been involved, however quietly, with AI research since the 1950s when it developed the classic checkers program and did work on machine translation and automatic theorem proving. Since then, work has been done on an ongoing basis at the company's Thomas Watson Research Center in Yorktown Heights, N.Y., as well as at its Paris and Palo Alto, Calif., scientific centers.

Although IBM does not have a specific group devoted to AI research, it has more than 100 people working on AI-type projects such as expert systems, speech recognition, natural language and text processing, Lisp and Prolog, symbolic programming and parallel processing. In fact, IBM announced in February that it would donate $30 million in equipment and personnel to support the effort at Cornell University headed by Nobel laureate Kenneth Wilson (see story Update/22) to construct a supercomputer using parallel architectures.

In addition, IBM has reportedly developed an experimental 512-microprocessor system called the Yorktown Simulation Engine, similar to the Ultra machine being developed at New York University.

Despite all of its research work, IBM currently offers only two AI-related products — its Lisp/VM, a version of the Lisp programming language that reportedly incorporates current programming techniques into a 370 time-sharing environment; and A Manufacturing Language (AML), a powerful robotic language used to program IBM robotic systems. A version of AML is available for the Personal Computer.

Although IBM remains tight-lipped about its research projects, it has admitted to development work on a number of AI-related systems. Getting the most attention is the interactive, continuous, real-time monitoring program for the MVS operating system called Yorktown Expert System for MVS operators (YES/MVS) [CW, April 8].

Monitoring and management of large systems like IBM's 370 require that problem-solving be done in real-time, a task becoming increasingly complex as DP installations and computer applications grow. YES/MVS is an expert system that can essentially perform automatically tasks performed by computer operators. Currently, YES/MVS can perform about two-thirds of all operators' non-manual functions. It can respond automatically to conditions in the system and summarize them.

Although IBM has been deluged with requests for the system, YES/MVS is still in the prototype stage and is not ready to be announced as a product.

In addition to YES/MVS, IBM is working on several other prototype systems including the following:

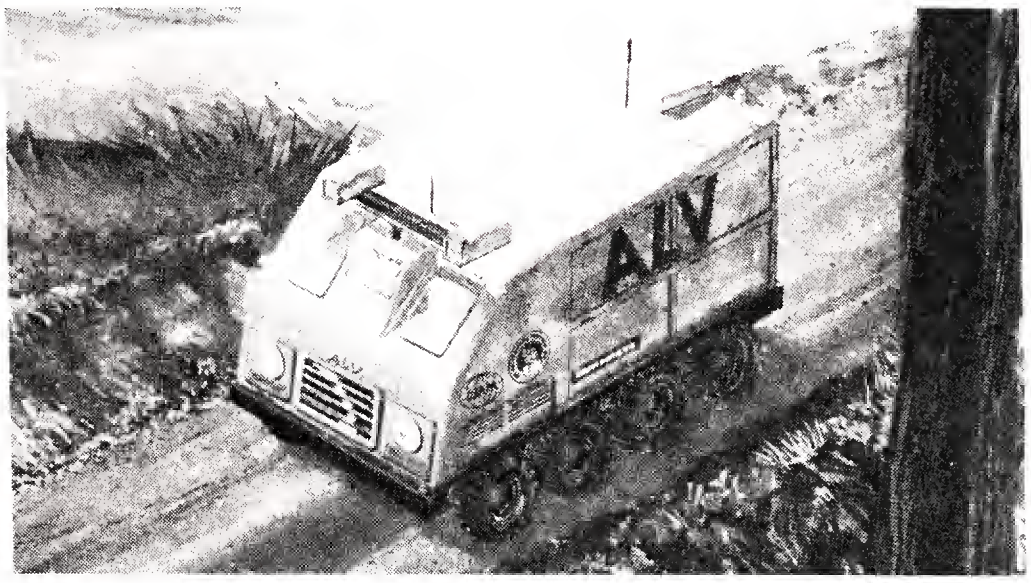


ILLUSTRATION COURTESY OF DARPA

Darpa's autonomous land vehicle will be ready for initial testing in Denver in the beginning of May.

- Transformational Question-Answering System (TQA). An outgrowth of early work in natural-language translation, TQA was designed for querying relational data bases in English.
- Epistle. An natural-language expert system that can check spelling, grammar and style with applications such as summarizing electronic mail.
- Scratch pad II. This system, under development for eight years at Yorktown Heights, contains extensive facilities for symbolic mathematical computation.
- Prism. A project from the Palo Alto scientific center, Prism (Prototype Inference System), is an experimental shell — a general-purpose development tool for expert systems.
- PSC Prolog. Developed by the Paris scientific center, this programming language operates on IBM 370s under the VM/CMS operating system.
- Handy. A user interface containing many of the elements required to allow work between end users and AI systems.

Darpa's computing project

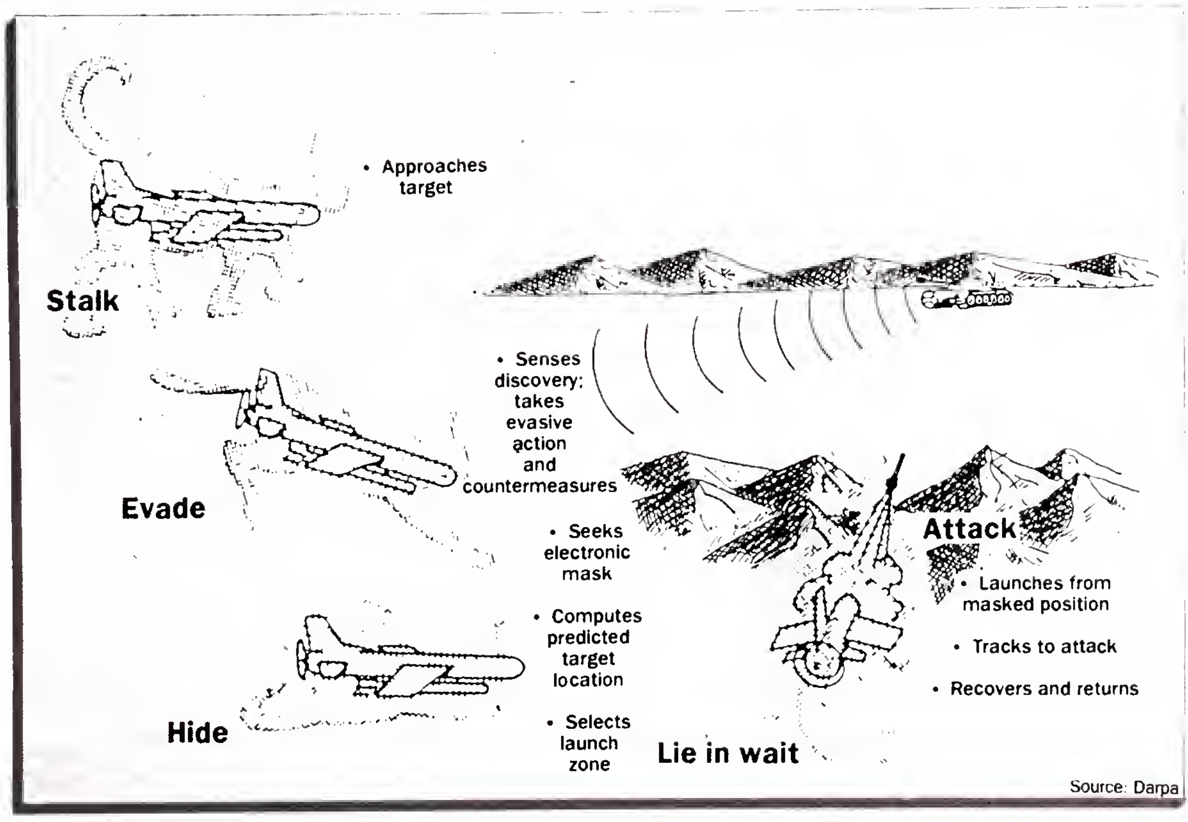
"The battlefield is no place for humans," someone once noted. Ironically, the military tends to agree, and toward that end, the Defense Advanced Research Projects Agency (Darpa) launched its $600 million strategic computing project in 1983. The military has long been the leading financer of innovative academic research in computing, and this latest plan is considered the biggest boost toward the fifth generation.

Although Darpa's initial thrust calls for the creation of three specific defense projects — the autonomous land vehicle (ALV), the pilot's associate and a battle management system — the research and development that surrounds these massive ventures will encompass virtually every aspect of fifth-generation computing. The plan calls for transcending today's computer capabilities by a quantum jump. Powerful computers will be developed, driven by expert systems, and the machines will be equipped with sensory and communications modules enabling them to hear, talk, see and act on information and data they develop or receive. "This new technology promises to increase our national security greatly," the Darpa press announcement reported.

Although academic and industrial researchers tend to downplay the romanticized science fiction images of intelligent machines, the Strategic Computing project inevitably conjures visions of *Star Wars* technology.

Battles of robots, driverless vehicles, sophisticated and intelligent fighter planes and weapons with the predatory instincts of animals are all represented in Darpa's ambitious plans.

PREDATION INCORPORATED INTO INTELLIGENT SYSTEMS



Source: Darpa

CW CHART

The military, however, has taken a pragmatic view as well. By parceling out the wealth to academia and industry through grants and contracts, Darpa is hopeful that the strategic computing project will effect a widespread technology transfer, allowing any and all advances to move into much-needed development in the private sector.

Backed by massive defense spending, the plan's original $600 million figure will more than likely exceed $1 billion before the initial project is finished.

According to Clinton W. Kelly III, director of Darpa's engineering applications office, the program seeks to develop a technological base that can be incorporated into new weapons systems.

"Our mission is to do the high-risk research that most of the individual services will not undertake because of the cost," Kelly explained. "We're chartered to always be at the leading edge, to push the frontiers out," he said.

The payoff, Kelly pointed out, must be correspondingly high — a 10 times improvement over current technologies. And the leading-edge components of computing attract most of Darpa's interest. "Computing, up until a few years ago, was incorporated into military equipment as an afterthought. Now, it has reached a level of sophistication and capability where it can't be an afterthought anymore," Kelly said. "It has to be part of the integral design of a system.

"There are a lot of computer-based systems out there that do certain things quite well in anticipated environments," Kelly added. "But if the environment changes, the systems are not intelligent enough to adapt."

Kelly was quick to point out that Darpa's function was not to develop weapons but a technology base that the individual services can exploit for weapons development. To this end, three major projects have been initiated.

Autonomous land vehicle

This first project, initiated prior to the formulation of the strategic computing plan, is part of an overall design for autonomous systems, such as unmanned aircraft, submarines and land vehicles. According to initial requirements, the ALV will be able to navigate cross-country, plan its route from digital terrain data and update its plan as its vision- and image-understanding systems sense and resolve ambiguities between observed and stored terrain data. Its expert local-navigation system will devise schemes to ensure concealment and avoid obstacles as the vehicle pursues its mission.

According to Kelly, the vehicle already exists and is set for initial testing at the end of May in Denver. In its first test, the vehicle is expected to move at 5 kilometers per hour, increasing to 10 kilometers per hour by November. "That doesn't sound very fast," Kelly said, "but you have to keep in mind that that is [1,000 times] better than anybody has done before."

See **FIFTH** UPDATE/19

Update

Esprit crucial to European technology

By Kenneth R. Sonenclar
Special to CW

With 441 proposals to choose from, the European Economic Community's (EEC) five-year European Strategic Program for Research in Information Technologies (Esprit) earlier this year awarded funding to 104 projects. The success of Esprit — akin in many ways to Japan's fifth-generation project — is vital to the long-term survival of an independent European computer industry. Nonetheless, other industry shortcomings — most beyond the breadth of Esprit or even the EEC — will have to be resolved if Europe's computer companies are to remain competitors in the 1990s.

Projects approved this year will receive about $130 million, with a matching sum contributed by the participating organizations. Funded areas and the number of projects include the following:

- Software technology — 14.
- Advanced information processing (artificial intelligence) — 20.
- Office systems — 23.

See **ESPRIT** UPDATE/24

Soviets' AI research takes shape

As the U.S., Japan and Europe gear up for the fifth generation, what is happening in the Soviet Union?

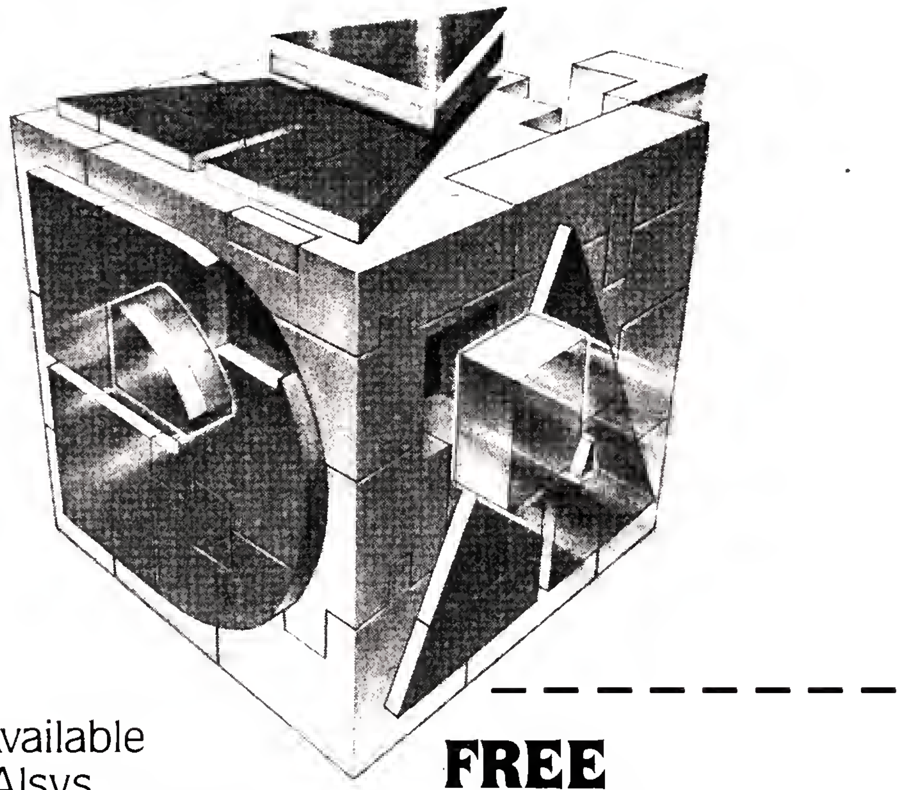
Though it is difficult to gauge how far the Soviets have come in computing technology, it is generally agreed that they lag far behind the U.S. and Japan in many emerging technologies.

According to retired Adm. Bobby Ray Inman, head of Austin, Texas-based Microelectronics and Computer Corp. (MCC), the Soviets have developed, within heavy industries that support defense, "a pretty good capability to take Western technology and adapt it to their own needs. They have been far less successful in creating new technology of their own."

Henry Firdman, a consultant, and Gabriel Jakobson, an AI researcher with GTE Corp. Laboratories in Waltham, Mass., are Soviet Jews who emigrated to the U.S. in the early 1980s. Both Firdman and Jakobson were deeply involved in AI research in the Soviet Union. Firdman, in fact, started the first laboratory devoted solely to AI research there in 1974.

Though both men were forced to discontinue work in the field when they applied for emigration, Jakob-

See **USSR** UPDATE/22



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FIFTH

from UPDATE/17

By 1988, after initial road-following techniques are perfected, the ALV will begin cross-country navigation. Concurrent with work on the ALV is the development of a walking machine capable of maneuvering over virtually any terrain.

Among the more ambitious goals for the ALV and the walking machine is to eventually incorporate the behavioral patterns of lower mammalian animals as they sense and react to threats as well as predation. Kelly said he is hopeful that the vehicle will be an analogue to interesting behavioral patterns in the animal world, such as the panther stalking its prey (see chart Update/17).

Battle management system

A second Darpa project — the battle management system — is aimed initially at naval aircraft carrier groups and is based on a multiperson, multiproblem paradigm. This system will be designed to help teams responsible for managing large-scale, fast-paced combat situations fuse information, generate options, make decisions and monitor events.

The contract for the system was awarded to Texas Instruments, last December and will face a twofold approach, according to Kelly. On the one hand, expert systems will have to be developed to handle extraordinarily complex problems created by many contingency assignments that involve large numbers of men and ships in tense, war-time situations.

In addition, there is the problem of communicating at the front and back ends of the system, Kelly explained. Senior officers and staff will not want to use complicated command sets and exotic languages to communicate with the system, so a natural-language and speech-understanding front end and similar back end will be required so that results will be offered in English.

Pilot's associate

The third project is the pilot's associate, whose objective is to create a phantom crew in the cockpit of an aircraft that will help the pilot fly and exploit various weapons systems and defensive systems on board. The prime motivation for this project (which has yet to award a prime contractor) is the increasing complication of aircraft. "Not only can the pilots not cope with the tremendous flow of information that's coming in as it is currently displayed to them, but they lack both the mental and physical abilities to extract from the airframe all it is capable of providing," Kelly explained.

The system will enable a pilot to off-load lower level instrument monitoring, control and diagnostic functions, freeing the pilot to focus on high-priority decisions and actions.

Kelly said he believes this capability is deliverable by the 1990s.

Although R&D work has been passed on to a long list of universities, research labs and corporations, Kelly said he is concerned that technology transfer goes beyond specific work on the military applications. He pointed out the implications of the battle management system for use in air traffic control, the pilot's associate for the commercial airline industry and the ALV for work in robotics.

Surprisingly, Darpa is anything but secretive about its work for this reason. Kelly said individuals and research groups are constantly being invited in to learn firsthand about the ongoing work. "We've run into occasional national security problems, but to the extent possible, we want to pump this technology out into the industrial base."

As the Strategic Computing program evolves, anticipation of its payoffs is high. Kelly tempers the enthusiasm with real-world pragmatism. "To my way of thinking, the ultimate impact of these kinds of technologies will be determined by how inexpensively you can deliver them," he insisted. "It's fine to talk about a missile system with all these capabilities, but if you can't deliver it for a very low cost, you don't have very much."

Fifth-generation projects are under way at more than 70 universities and many research laboratories and corporations. A broad expanse of technology is being developed covering a wide range of applications. Projects once considered impossible are in prototype stages, including advanced vision systems, speech and voice recognition systems, computer-aided instruction systems and computer-aided design and manufacturing systems incorporating both AI and advanced robotics.

The work is made more exciting and tantalizing to both "techies" and humanists because it encompasses and irrevocably intertwines many diverse disciplines such as philosophy, mathematics, humanities and the arts, computer science, psychology and linguistics.

■ **MIT.** MIT has been at the forefront of AI research since the discipline was formulated in the mid-1950s. AI pioneers such as Joseph Wiezenbaum, Marvin Minsky, Patrick Winston and Randall Davis have led MIT's efforts to move AI from a set of intellectual academic theorems to real systems with practical payoffs. A spate of MIT alumni have spawned commercial ventures using technologies that were developed and refined at MIT's Artificial Intelligence Laboratory.

See **FIFTH** UPDATE/23

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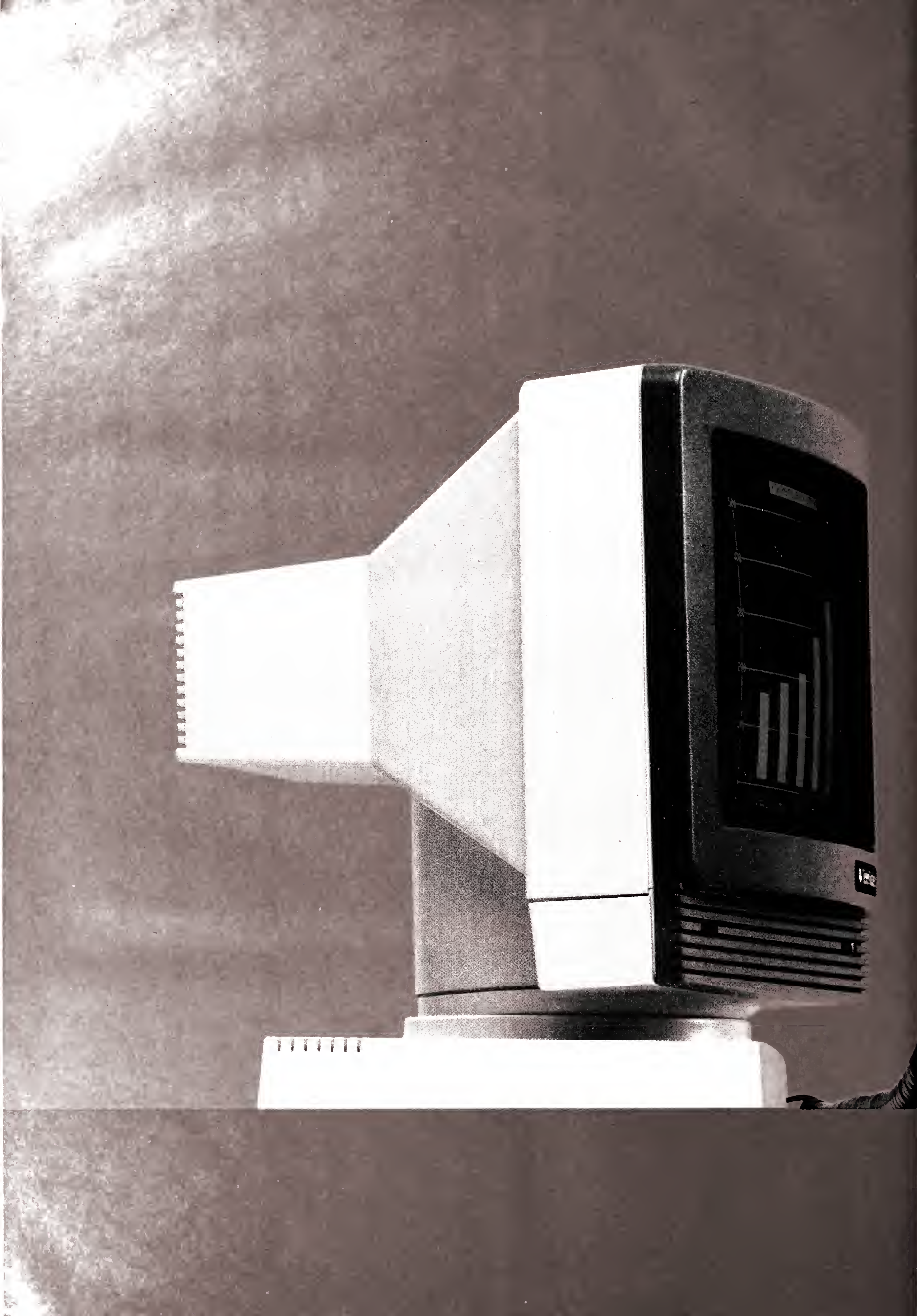

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WILSON

from UPDATE/7

puters and will be upgrading them quickly. The bulk of the market will lie in the low end (machines priced at several hundred thousand dollars), but installations at all price levels, including over $100 million, will exist.

■ Supercomputers will be closely integrated with three-dimensional color graphics. The desire for real-time graphics displays (60 frames per second) of the progress of three-dimensional simulations will create an extraordinary demand for supercomputer upgrades and other technological advances. Real-time graphics of this sort requires roughly 100,000 times the peformance of current supercomputers. This performance level will not yet have been reached in 1990 but will be close enough so that pressure to reach it will be immense.

■ A flowering of scientific, technological and artistic endeavors will accompany the increasing power of supercomputers. Virtually all graduate disciplines in such fields as science, engineering, biology and medicine will be making essential use of supercomputers.

■ Supercomputers will be playing major roles in industry. They will be used throughout the U.S. industrial base — in chemicals, oil, aerospace, glass, photography and image processing and high technology — to shorten product development cycles and help engineers achieve new levels of product optimization with respect to low cost, high quality and environmental compatibility.

Industry-university joint efforts will increase rapidly as cooperation between basic university research and industrial applied research becomes more and more fruitful.

All of the predictions I have made for 1990 are based on trends visible today. For example, all of today's supercomputer manufacturers are moving to incorporate parallelism into their designs.

Today's supercomputer market is small because of the multimillion-dollar price tags on supercomputers. There is a huge market vacuum for a line of supercomputers that can be assembled and then upgraded step-by-step in $100,000 increments, fitting in well with the present multibillion-dollar supermini market.

Today, in forefront computer graphics efforts such as those at Don Greenburg's Center for Computer Graphics at Cornell University, it often takes eight hours of supermini-level processing to produce a single graphics picture. Further processing power is required to generate a single graphics picture from a three-dimensional simulation.

Few such simulations are attempted on current equipment. No one familiar with the processing power needed to support graphics will be surprised by the estimate that a machine 100,000 times as powerful as a Cray supercomputer would be required to support real-time graphics.

Throughout the graduate programs at Cornell and around the country, students work on a thesis project, attacking the most complex problems in their disciplines. Supercomputers are designed to handle precisely this complexity.

Complexity arises when a planetary scientist wants to understand Saturn's rings, which contain thousands of rocks, instead of the simpler problem of one planet circulating the sun. Complexity arises when an automobile engineer tries to understand the turbulent flow of air underneath an automobile, including every swirl and eddy past the tires and oil pan, instead of just smooth airflow past a perfect sphere. Complexity arises when an economist studies a regional economy of many different sizes of towns and factories instead of just overall gross national product figures.

Beyond this, there are two areas of scientific and engineering inquiries of overwhelming importance and equally overwhelming difficulty: the turbulent flow of gases and liquids and the precise nature of the chemical bonds that bind atoms in molecules. Both of these problems recur in many scientific disciplines and technological applications; both are of multibillion-dollar importance to industry; and both are major unsolved problems of scientific research of over 50 years' standing.

In 1990, a major effort pushing supercomputer technology to its limits will likely occur in order to make progress on these problems.

By then, supercomputers in universities should be widely distributed among departments and individual faculty members, just as superminis are today. However, in the meantime, the strong supercomputing programs already in existence at Cornell and the University of Illinois should play a major role in moving from the current era of expensive vector machines to inexpensive parallel machines.

An intense but friendly competition should develop between these two universities to be the first to achieve major breakthroughs in parallelism. Each university will be working with industrial partners — Illinois with Cray Research and other companies and Cornell with IBM, Floating Point Systems, Inc. and others.

Finally, in 1990 the U.S. will likely face more intense international competition in supercomputers than it does today. Over the last 10 years, the major Japanese manufacturers, such as Fujitsu Ltd. and Hitachi Ltd., have risen from scratch to develop supercomputing products competitive with the best the U.S. has to offer.

The Japanese manufacturers have formidable resources at their disposal to continue supercomputer development. I believe that the U.S. can gain a temporary edge if it moves rapidly into parallelism, but foreign vendors will press hard to catch up. Competition will intensify as it becomes clear that a multibillion-dollar market is at stake.

Dr. Kenneth G. Wilson, a 1982 Nobel laureate in physics, teaches at the Floyd R. Newman Laboratory of Nuclear Studies at Cornell University in Ithaca, N.Y. He was recently named director of the new National Advanced Scientific Computing Center at Cornell. Among the center's first major ventures is a joint development project with IBM on a new architecture for supercomputers.

A NON-VON NEUMANN PARALLEL PROCESSING SYSTEM

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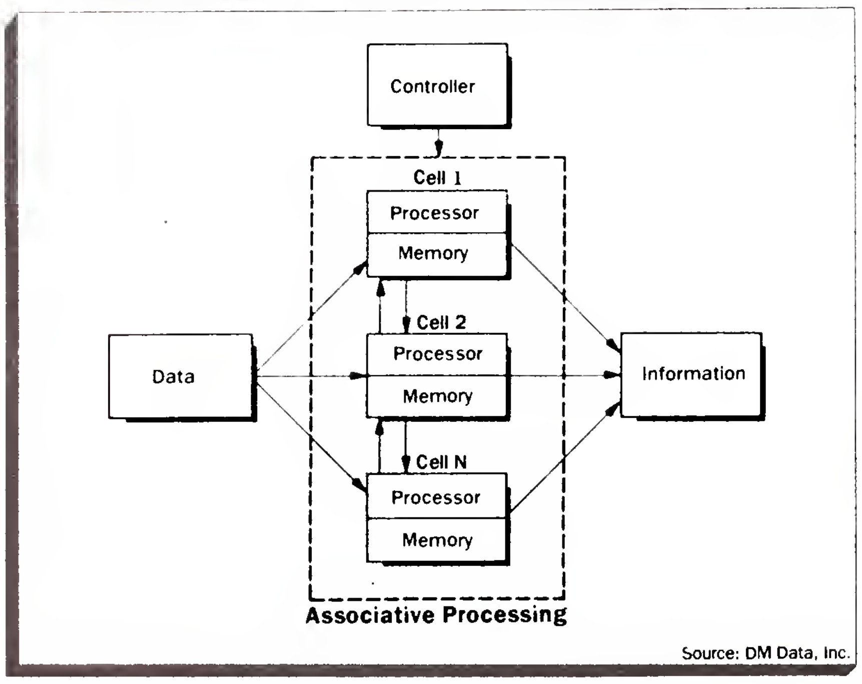

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USSR

from UPDATE/18

son continues to track AI activities in the Soviet Union through his former ties.

According to Jakobson, fundamental AI research in the Soviet Union compares to work being done here, but applied research is not state of the art. On the other hand, he pointed out that the strong Soviet tradition in mathematics research has encompassed work in linguistics and natural language development.

Despite its deficiencies in AI hardware, the Soviets have begun to respond to the fifth-generation call, and work is spreading rapidly.

According to Jakobson, the Soviet Academy of Sciences has an academic computing center in Moscow studying AI and natural language processing. "The Soviet Union is a huge country, and hundreds of people are working on AI research," he said. "They can concentrate their efforts very quickly and get results."

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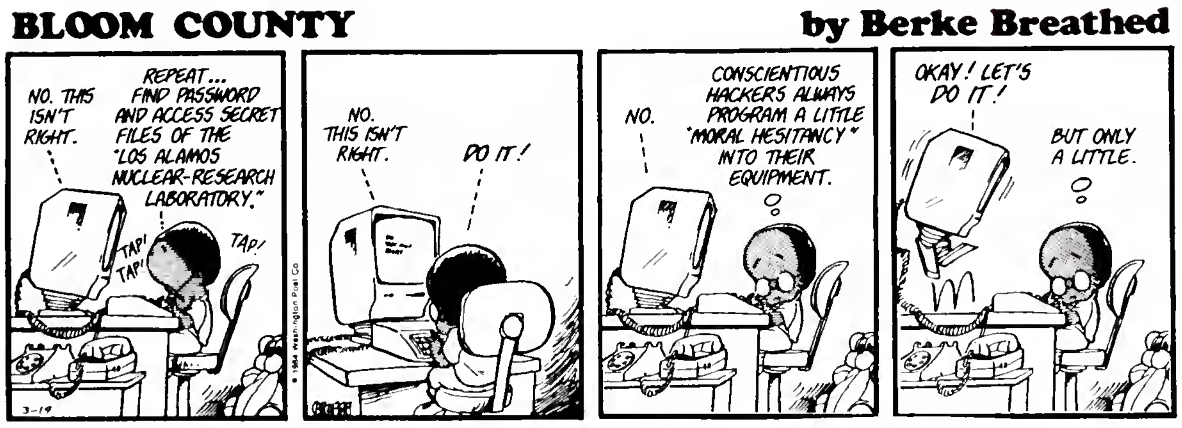
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FIFTH from UPDATE/19

Winston, currently director of MIT's AI lab, has written several noted books on AI and is deeply involved in research on computer learning. With the recent flood of interest in the commercial possibilities of AI, Winston has seen the conflict firsthand.

"Whenever a field catches the public eye as AI has, there's bound to be a certain amount of tension between people of varying dispositions," Winston said.

Winston admitted that the search for top-notch AI researchers is getting tougher as the large salaries from industry have begun to lure them away. "Sure, we've lost a few people who we would have preferred to keep, and I'm speaking more in terms of the field than just MIT," he said. "But a few people have left research to go into the field and work on proprietary commercial products. From one point of view that's unfortunate. But from the other side, it's a sign of the maturing of the field."

With large grants from Darpa as well as significant corporate contributions of money and equipment, MIT remains able to focus on its many research projects. The AI lab has major commitments to work in robotics, which encompasses computer vision, manipulation and the connection of perception to action. It is also at work on "deep" expert systems, which Winston described as those delving beyond existing expert systems technology into models that reason and employ problem-solving paradigms that are not rule based.

In addition, a wide range of smaller activities are under way: computer learning, natural language, common-sense reasoning, parallelism (the lab is at work on a prototype of a machine with one million processors) and the development of basic theories on intelligence.

Although only a few feeble attempts at commercializing computer learning have been made, Winston said he is pleased to see interest in the area begin. The idea of creating a computer that will teach itself is not new, but it remains among the most difficult problems to solve. Winston's work at MIT is currently integrating computer vision work in hopes of creating a prototype that will learn about the world by looking at it and thinking about the functions it will perform.

"In the next 10 years, we will see learning emerge as an extremely important characteristic of commercial systems because the world is too complex to spoon-feed computers everything they need to know," he said. The fundamental problem blocking AI work at MIT and elsewhere, according to Winston, is the shortage of people who can do truly outstanding work in this difficult medium. "Our primary limitation is that there are only a few 'universe-class' people who are likely to shift our paradigms," he said.

■ **Digital Equipment Corp.** DEC, the Maynard, Mass.-based minicomputer giant, has had a long and rewarding relationship with the AI community. Its minis continue to be a popular choice for AI development work. The company spends heavily in support of AI research at universities, and in 1979, DEC began using an expert system internally with the advent of the Xcon system.

Xcon is perhaps the most well-known industrial AI success story to date. The system, refined by John McDermott at Carnegie-Mellon University, is now an integral part of DEC's manufacturing facilities, configuring every VAX and PDP-11 order. The success of Xcon has spurred development of layered add-ons called Xsel and Xsite. Xsel is a sales representative's assistant, interactive and friendly, which incorporates all of Xcon's knowledge but helps the sales representative configure and sell the system to the customer. Once a system configuration is completed, Xsite can be used to do site preparation work.

According to Arnold Kraft of DEC's AI marketing group, those three systems are the largest expert systems in use in industry today. DEC has not stopped there, however, more than 20 additional applications are under development for internal use. Despite its success thus far, DEC does not offer its expert systems for sale. "We share the names and details with our customers, but it is only to let them know what we are doing and give them the courage to proceed on their own," Kraft said.

Kraft pinpoints DEC's success in the emerging AI world as the ability to combine commitment to innovation with a pragmatic understanding of the real world. "There are a lot of problems out there that still haven't been touched, and AI will help a great deal," Kraft said. "But the people out there with the problems are in real-life situations, and they don't want to replace everything they've done in the past — their software libraries or their manual procedures. They would like to complement what they have. I believe those are the people who are going to succeed first in using AI."

Winston

■ **Microelectronics and Computer Technology Corp (MCC).** As the rush toward advanced computer technologies increases, the quest for R&D in a variety of areas has launched a spate of consortiums around the country. MCC in Austin, Texas has made among the most widely publicized and ambitious efforts. MCC, independent and for-profit, was founded by a group of industrial corporations such as DEC, CDC, NCR Corp., Sperry, Gould and others as a direct response to Japan's announcement of its ambitious fifth-generation project.

It has become increasingly clear to American industry that it is extremely difficult for any one corporation to handle the scope of R&D necessary to keep this country in the forefront of technological advancement, especially with Japan's unrelenting charge toward the same world markets.

Thus, MCC offered a way for companies to hedge their bets while bringing together top-flight talent and resources for high-risk research. Rather than turning to government, MCC's founders decided that a private consortium offered a more effective way to pool resources.

When it began operation in January 1983 under newly selected Chief Executive Officer Bobby Ray Inman, a retired admiral, MCC initiated four major development areas: advanced computer architecture, packaging and interconnect technology, software technology and very large-scale integration CAD. Under the advanced computer architecture group were four subgroups: human interface, AI, parallel processing and data base. Member corporations or shareholders purchase a share of MCC and must join one or more of the four programs for which they contribute funds and personnel.

According to Inman, the genius of the plan was that it allowed companies to focus on long-term problems without bringing in current proprietary technologies. By working in areas where none of the shareholders had significant prior efforts, a company could invest $10 million and, in 10 years, have received $100 million in research.

MCC has nearly 300 employees — 60% of whom are direct hires — and 20 member companies. Because of the long-term nature of its work, MCC will not discuss any of its specific projects or additional planned ventures. "The U.S. as a whole will remain competitive with the Japanese, and MCC is going to contribute to that," Inman said. "There may be some surprises, some early deliverables in areas like software, production of software, data base management and human interface. The gains in AI and parallel processing are likely to be farther out."

Despite its lofty goals, MCC has run into obstacles. The problem of having some companies participating in one discipline but not another has raised questions about the viability of technology transfer. Also, its proprietary nature makes it difficult to view MCC as a national resource aimed at countering the Japanese.

In addition, Gordon Bell, vice-chairman of Encore Computer Corp. and a leading proponent of the formation of MCC, said that such projects and corporate America in general are missing the most significant point. "There is sort of an intellectual pecking order here which has science first, engineering second and manufacturing third," Bell said. "And by the time you get to manufacturing, there aren't any smart people left. What it amounts to is that we really can't make things anymore."

The outlook

Ten years may be a lifetime in the traditional computing industry, but artificial intelligence represents a step beyond tradition. Though the continued miniaturization of technology in both size and cost promises to extend the horizon line of the fifth generation by impressive jumps, the quantum leap forward for AI clearly remains 20 to 30 years out.

According to Morley and Taylor of Gould, a flying bumblebee and a Cray supercomputer are comparable in computational energy. The bumblebee and the Cray computer process the same number of bits per second, but hardware, they pointed out, is not nearly fast enough for human emulation.

Despite this, researchers continue to pursue machine intelligence on many levels, undaunted by the overwhelming odds or the seeming impossibility of imagined goals. The march toward the fifth generation may see breakthroughs in paradigms, or it may continue to be a trudging, evolutionary process. A 10-year period, experts agreed, is simply not enough to expect to see a revolutionary type of change.

MIT's Winston views the future as a staircase. Knowledge accumulates on one step for many years without any commercial use, until all of a sudden it gets used voraciously, and the technology moves up a step. "This will happen in AI," he predicted. "Systems will not change much for 10 years, then suddenly there will be a revolution. New paradigms will be rapidly incorporated into commercial products."

According to Stanford's Feigenbaum, in 30 years the effect will be dramatic. Knowledge, he pointed out, will be viewed in a different way then today. It will no longer simply reside in books but will be on-line and will be accessed by need in the concept of the living library, a library responsive to a user's needs.

"These tools," Feigenbaum stated, "will become active agents, intellectual aides to a great deal of our routine business, industrial, engineering, scientific and financial way of thinking."

ESPRIT

from UPDATE 18

- Computer-integrated manufacturing (CIM) — 19.
- Advanced microelectronics — 28

A prerequisite for Esprit funding is that at least two industrial organizations from separate EEC-member states be involved in a research effort.

The result is that 270 companies, universities and research institutes are represented in the first year of the program's main phase. The majority, naturally enough, are based in the UK, France and West Germany. Among private-sector participants, 50% of all projects involve small firms.

It is clearly too early to gauge the quality of the work that will emerge from the Esprit projects. The research covers a wide array of advanced technologies and the participating organizations seem to have many of their good people involved.

From a European's vantage point, fifth-generation computers may offer Europe its last chance to build a domestic computer industry. U.S.-based companies today supply about 45% of Western Europe's information processing equipment. Japanese vendors, though now providing a considerably smaller percentage, are making significant inroads into the European market.

European computer makers, though fortified with ample resources and a home market potentially larger than that of the U.S., have fared unimpressively, with some requiring state subsidies and protective measures to carry them through hard times. What's more, as the march of technology shortens product life cycles and demands larger amounts of capital to remain competitive, European companies are joining forces with Japanese vendors, or in the case of Olivetti Corp., with AT&T, to battle the giant of European computing — IBM.

This is an opportunistic and usually successful short-term policy. However, just as the Japanese vendors will eventually shed their American partners (or absorb them) to attack the U.S. market directly, a similar pattern will follow in Europe. Esprit, it should be noted, is by no means the only research and development effort aimed at developing a European fifth generation. The Alvey program, the UK's $500 million fifth-generation project, has been under way for two years. Smaller government-funded efforts are moving ahead in France and West Germany. In addition, most of the large computer firms and many large end users are funding AI research projects.

On the positive side, there seems little doubt that the Europeans are capable of making important and potentially marketable contributions to next-generation systems.

In addition, European banks and insurance companies, which will be among the first users of expert business systems, appear at least as open at this point to bringing the new technologies into their businesses as are their American counterparts. This should provide European AI vendors with good testing grounds and, eventually, more eager customers.

Unfortunately, the problems facing Esprit are numerous. Simply coordinating work across long distances and coping with differences in language, corporate cultures and corporate strategies will be difficult, despite the relatively limited goals of the program. Esprit projects, it must be noted, are limited to precompetitive research.

On the positive side, there seems little doubt that the Europeans are capable of making important and potentially marketable contributions to next-generation systems.

It will be at the development stage and beyond, however, that more long-standing problems will surface. After all, Esprit will be meaningless if the results of its research cannot be translated into products and jobs. Among other inhibitors to growth are the following:

- Little venture capital is available to European start-ups that might produce and market Esprit-derived technology.
- European MIS managers are far less open than their American counterparts to purchasing from small, unproven vendors — and the same goes for European governments.
- Relations between private companies and leading research universities, an increasingly important factor in the U.S., remain very poor in Europe despite the step forward that Esprit represents.

Given the long list of challenges facing the European computer industry over the short- and long-term, it would not be surprising if, as with today's technology, Europe ends up importing much more of the fifth-generation technology than it exports.

Sonenclar is director of artificial intelligence research at the Gartner Group, Inc. in Stamford, Conn.

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New partners in information

By Harvey Poppel

Within the past two years, once-iconoclastic IBM has affiliated with such diverse partners as Sankyo-Seiki, Sears Roebuck & Co., Merrill Lynch & Co., CBS, Rolm Corp., Intel Corp. and Stratus Computer, Inc. AT&T has struck deals with United Technologies Corp., N.V. Philips, Electronic Data Systems Corp., Convergent Technologies, Olivetti Corp., Ricoh Co. and Japan ENS. General Motors Corp. has acquired EDS.

In just one year, from 1982 to 1983, information industry acquisitions zoomed 31% vs. an average in all other industries of 4%.

The underlying rationale is compelling. Information industry corporate planners are seeking sustainably higher returns on their shareholders' equity (ROE). They have come to realize that the underlying tradeoffs to growing ROE have tilted away from internal development and toward external development. True, internal development still has its advantages. Most important of these is control. Research and development teams can be focused on specific targets, and funding spigots can be opened up or closed down.

In many instances, internal developers can continue the pace of commercialization and the degree of conformity with industry standards. The resultant product and service can be highly proprietary or open for others to share and leverage. Moreover, internal developers are bred from the same corporate culture and pool the benefits of cumulative experience for their corporations.

But many companies that have relied solely on internal development have been frustrated by their inability to keep up with, much less exploit, the accelerating pace of information technology and marketplace dynamics.

Infotrends

There are five fundamental, yet interrelated, forces — "infotrends" — that drive external development.

As emphasis swings from the mass marketing of generic facilities to the specialized, often vertical marketing of content-differentiated products, the available R&D dollars and talent are spread too thin to satisfy all (or any) development imperatives. As a result, hardware and telecommunications firms, previously vertically and horizontally integrated, are seeking content-laden partners.

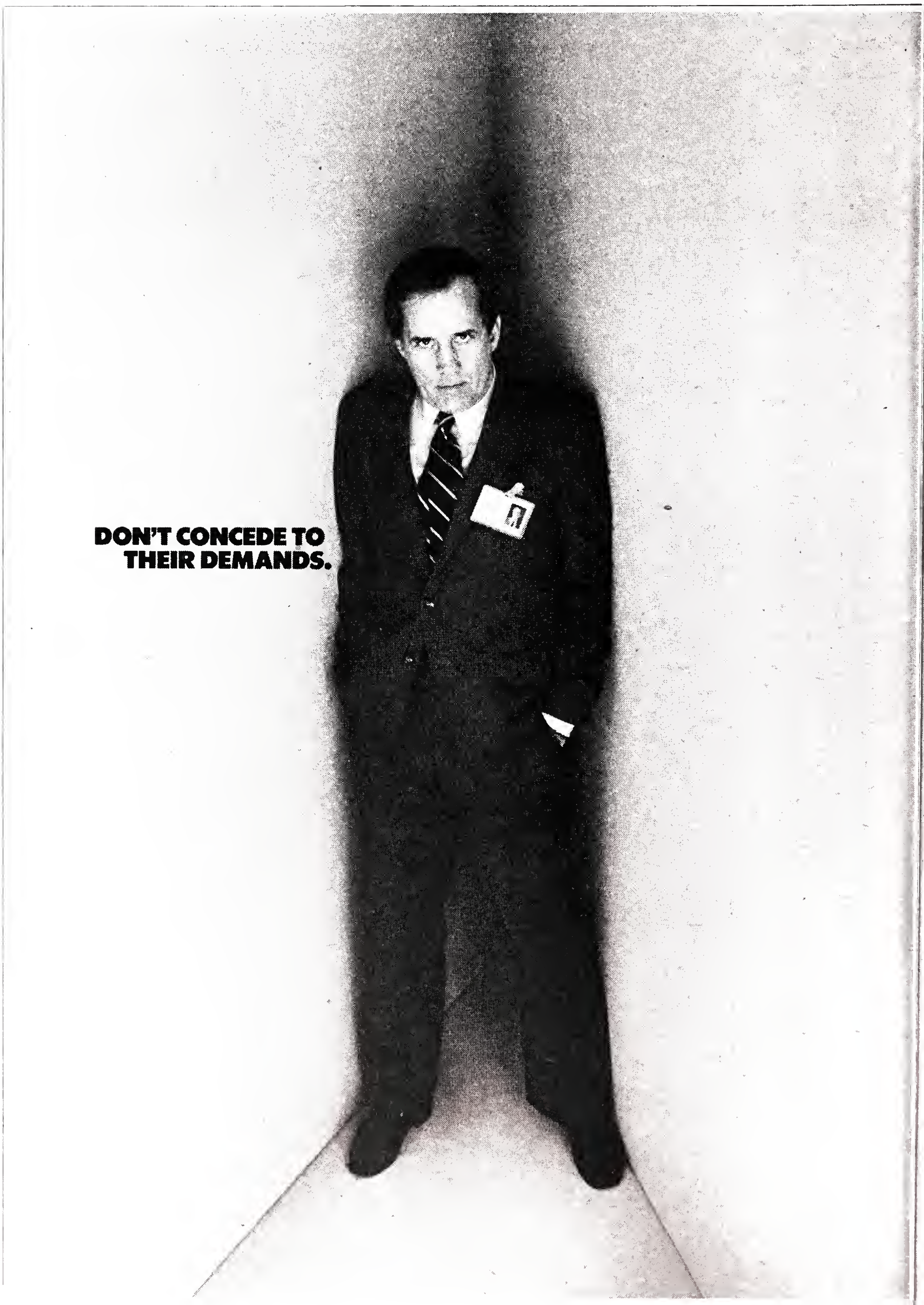
For example, Wang Laboratories, Inc. has begun to take positions in data bases related to document preparation (including the exclusive electronic publishing rights to the *Random House Dictionary* and *Roget's International Thesaurus*). Apple Computer, Inc. and most other computer manufacturers are increasingly cultivating value-added resellers with differentiative applications software through co-marketing arrangements and even, in some cases, financial and technical support. Local telephone companies and value-added network carriers are encouraging interconnections and joint marketing of audiotex and other electronic bases.

End users become more sophisticated; they are seeking "interoperability" — which I define as the perfect exchange of content — even where that content has to travel across disparate I/O devices, operating and data base management systems, network architecture and CPU's, provided or operated by multiple suppliers. The quest for interoperability has led some content companies to enter the networking business to facilitate the electronic distribution of their data bases, software and applications processing. Dun & Bradstreet Corp., for example, now has Dunsnet, and General Electric Information Services Co. has Marknet.

Also, numerous computer, office and telecommunications equipment companies have co-ventured with other suppliers in the following areas:

- The physical interconnection of their products; for instance, Northern Telecom, Inc.'s computer-to-private branch exchange interface.
- Electronic mail; for example, X.400, the Consultative Committee on International Telelephone and Telegraph's Message Handling System.
- The compatibility of their operating systems; for example, the recent European supplier agreements involving AT&T's Unix.
- The interface between systems and applications software; for example, the Japanese Microsoft Extended Basic (MSX) project to standardize low-end home computer operating systems.
- The compatibility of storage media and drives (for example, compact disk/read-only memory [CD-ROM]).
- A broader set of industry-specific interoperability standards, such as GM's proposed Manufacturing Automation Protocol.

More than simple agreements and co-ventures, however, some players involved in communications hardware have begun to acquire others who have interconnecting components. Among the products that fit together in an interoperable system are terminals, coders, modems, local-area networks, multiplexers, switches, concentrators, private wide-area networks and network management devices. And external developments among suppliers of these and other related products are spreading



rapidly. As interoperability becomes more universal, so will direct content exchanges between buyers and sellers. This can be business-to-business, such as with industrial products, or business-to-consumer.

Some information service companies, such as Control Data Corp. with Redinet, General Electric Co. with Dealertalk and McDonnell Douglas Automation Co. with Edi-Net, are attempting to lock up certain business-to-business segments.

Others, like Trintex and Keycom, are focusing mainly on the broadly based business-to-consumer segment. This is leading to massive restructuring of other industries and the potential bypassing of intermediaries between buyers and sellers. I call this process "disintermediation."

Some of the endangered species include travel agents, banks, wholesale distributors, outside sales forces and certain classes of retailers.

The specter of disintermediation is spurring businesses with deep roots in other industries to enter the information industry. Several banks and aerospace firms have been among the leading computer servicers since the 1960s. But now they are being joined by other financial institutions, such as Cigna Corp. and Merrill Lynch, and other types of manufacturers, such as GM and Toyota.

Moreover, leading players in other industries are joining the fray, including retailing (Sears, J.C. Penney), distribution (McKesson) and transportation (American Airlines, Norfolk Southern Railway Co.). Some, like Gulf & Western, which is acquiring Prentice-Hall, may simply be diversifying into what they perceive to be a more robust industry. But most of the others are impelled primarily by the need to control the restructuring of their core businesses and only secondarily by the diversification opportunity.

Interoperability and disintermediation are both causes and effects of global markets. Globalization is a very powerful rationale for external development. One goal is to gain economies of scale by spreading fixed and semifixed costs over a broader geographical base.

But even the largest firms are finding it increasingly difficult to deepen penetration in foreign markets unilaterally. As a result, they have established collaborative relationships with strong indigenous players. Xerox Corp. (Rank Xerox, Fuji Xerox), Honeywell, Inc. (Bull) and Fujitsu (Siemens AG, TRW, Amdahl) were among the first to go this route during the 1960s and '70s.

Some of these partnerships no longer exist, and there were relatively few followers until recently. Now such diverse U.S. entities as AT&T Technologies, Dun & Bradstreet, RCA Corp., MCI Communications Corp., General Electric, Ameritech and Honeywell are leveraging their products and services, in part through joint ventures and other collaborative agreements with foreign firms.

A second goal related to globalization is to gain access to leading-edge markets and technologies. And this is the principal rationale for the intensifying invasion of North America by European and Asian firms, most often through external development. U.S. print and electronic publishing has become a hotbed of external development activity for British, Dutch and Australian publishers.

Japanese firms, for the most part, have opted for collaborative arrangements in the U.S., rather than outright acquisitions. In many cases, these are OEM arrangements; for example, Ricoh, Canon and Toshiba manufacture image equipment for U.S. partners such as AT&T, Eastman Kodak Co. and 3M Corp. to market domestically. Some are joint development efforts, such as Sharp and RCA in Cmos.

Other collaborations leverage Japanese manufacturing and technology experience. Examples include Toshiba and Westinghouse, which are jointly manufacturing CRTs in the U.S., and NEC Corp., which is developing integrated circuits for Corvus Systems, Inc.

Europeans are especially interested in the U.S. A late-1984 survey of European chief executive officers published in *The Wall Street Journal* showed that 45% picked the U.S. as the first choice for foreign investment. Only 28% picked other European countries. Olivetti, AT&T's partner in certain

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European segments, also has cultivated several dozen equity positions in U.S. companies. Siemens AG, Plessey Co. and Racal Electronics are among the more acquisitive European hardware firms, while Nixdorf Computer AG, Ericsson, CIT Alcatel and Nokia seem to favor joint ventures and other such vehicles.

Ultimately, it is the convergence of information industry interests among the leading players that is driving them to high levels of external development activity. IBM proudly asserts its intentions to be a $100 billion company by 1990, $185 billion by 1994. Few question its R&D competence, but the goal of achieving and then surpassing a 5% share of the world's swelling information industry market undoubtedly will lead the company to expand external development in the years ahead. Other publicly held firms, smaller than IBM and lacking R&D critical mass, will rely even more on external development in the years ahead. Many are severely limited by current profit and cash-flow pressures in expanding their R&D budgets but can leverage their stock value or debt equity position in acquiring other firms.

Some smaller, privately held firms are in an even tighter bind. Venture capitalists, until recently their primary funding source, are strung out, and the initial public offerings market has tightened up markedly. During the halcyon days of 1983, some 75% of $3 billion to $4 billion in venture capital went into the information industry, while some 120 companies in the industry went public for the first time, raising another $3 billion.

By 1984, those funding sources had dropped by 40%, and they are unlikely to recover fully for some time. Worse yet, if all companies financed by venture capital in 1983 alone had been initially successful, they would have required an additional $9 billion over the ensuing two to four years to keep going, shutting out subsequent start-ups.

And even where available, R&D monies don't go as far as in the past. Good R&D talent is hard to find, motivate, control and retain. R&D facilities are growing more asset-intensive. Information technologies are becoming more specialized, and the failure rate of new product development is high.

R&D isn't the only area where scale and scope are critical. Many manufacturing, software and service companies find they lack distribution leverage. The leverage they seek may be geographic or horizontal scale, or it may relate to boosting sales productivity or tightening account control. As a result, larger information industry firms with substantial marketing, maintenance and physical distribution capabilities can often readily acquire or collaborate with the manufacturers and developers of their choosing, especially those who bring vertical product market expertise to the table.

The computer service and software sector of the industry was the first to come to grips with these external development drives, and other companies, confronted with them for the first time, would do well to heed the microcosmic lessons learned by this sector.

First, consider the trend in computer services and software. Since 1969, the number of annual U.S. acquisitions has swelled from 20 to nearly 150. Initially limited to raw facilities firms — mainly batch data processing centers, contract programming and time-sharing — the majority of deals now are in content-related areas: software, value-added reselling and remote transaction processing.

Many of the early deals were stock swaps and other easily valued transactions. Nearly 75% of today's acquisitions involve cash, and more than 60% involve contingency valuations, such as earnouts (the amount of money that is paid is contingent on how well the company does after it is acquired).

Automatic Data Processing, Inc. (ADP) was one of the pioneers in growth primarily by external development. By 1973, ADP had already made more than 40 acquisitions, and by year-end 1984 it had completed more than 100. ADP stands alone among all publicly held firms in the information industry in recording more than 25 unbroken years of growth in revenue and profits. Many other information service firms have been relatively successful in external development. Dun & Bradstreet's 1983 acquisition of McCormack & Dodge Corp. stands out in retrospect as a particularly shrewd deal for both parties.

Indeed, there is a growing affinity among content-based information service firms, hardware and telecommunications firms. Younger software suppliers, transaction processors and data base developers find that they cannot afford to develop national, much less international, distribution power by themselves. Microcomputer retailers are highly selective in stocking software and hardware from smaller, unproven firms. Specialized data base providers and transaction processors lack end-user visibility unless promoted by a strong marketer.

Besides distribution, emerging players lack the wherewithal to develop next-generation products because they are stretched out fully trying to make the current generation successful. Meanwhile, larger companies in hardware, telecommunications, publishing and outside the industry know that they cannot marshal enough talent, vertical market knowledge and, hence, produce internally to satisfy their growth objectives and market strategies. They need those smaller content-based firms. And that is why the computer services and software sector has been an early hotbed of convergence.

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Outright acquisitions of publicly held firms are expensive. Since 1980, the price/earnings ratios of publicly held information industry players have ranged from double to triple the Value Line 950 all-industry average. On top of that, the acquisition premium (the amount paid over the trading price two months before the acquisition announcement) has averaged 20% more than in other industries. This means that the more successful of the acquired publicly held companies typically are being capitalized at 25 to 40 times earnings. Strategic rationale notwithstanding, this places a tremendous onus on the acquirer of a publicly held firm to pay back its external development investment.

To reduce the risk of not recovering their investment, information industry firms are increasingly pursuing other options. These include acquiring privately held firms with more modest capitalization ratios, often ranging between eight and 15, rather than 25 to 40.

In computer services and software, where deal-making is a way of life, the median transaction has been between $4 million and $5 million. And 75% of acquired companies have been lower profile, privately held businesses. In fact, only 3% of acquired information services companies have been stand-alone, publicly held, the balance being divestitures of parts of publicly held firms.

Clearly, the bigger deals, like GM/EDS, McDonnell Douglas/Tymshare, IBM/Rolm, Dysan/Midec and D&B/A.C. Nielsen, may grab the headlines, but they are just the "tip of the chip" when it comes to information industry external development.

Stopping short of outright acquisitions, some firms favor joint ventures with no equity exchanges and no readily determinable valuation. Nevertheless, such arrangements, especially joint ventures, have often proven unstable because the strategic interest of the parties, even when congruent at the outset, typically diverges over time. Witness Honeywell/Bull — a marriage that was eventually annulled; Satellite Business Systems, Inc. — where two of the three original owners have tuned out; Fujitsu/TRW — a mismatch of intentions and contributions; and Anaconda-Ericsson, Inc. — unquestionably a naive choice by Ericsson for U.S. entry. Governance clashes often paralyze or confuse the management of these ventures. Moreover, the venture typically lacks a coherent culture unless the partners are very similar, which is rare.

One less risky vehicle for information industry firms is to invest in venture capital pools directed at areas of potential strategic leverage. Some firms have made the mistake of commingling their monies with others, leading to conflicts and fuzzy objectives, as with joint ventures.

I believe it is better for a firm in this industry to establish its own dedicated pool, typically $10 million or more, with clear-cut strategic objectives relating to specific areas of technology, market or product development. This strategic capital fund can then be invested in multiple situations, thereby spreading the financial and developmental risks, while maintaining a clear strategic rationale. These investments, which can be managed internally or by an outside agent, can take many forms — minority equity purchases, loans, OEM discounts or R&D resources — with the ultimate objective of jointly leveraging the portfolio companies' capabilities, once mature.

But regardless of the external development vehicle, from outright acquisition to strategic capital funds, successful external development depends on four critical factors:

- Staying close to and leveraging experience and expertise — what we call the "strategic core." A survey of the Fortune 100, often quoted by one of the major management consulting firms, shows that only 27% of unrelated acquisitions have been successful, while 64% of those related to an existing internal product, market or technology have been successful.
- Relatedness isn't enough; companies should go for strong, longer term marketplace-driven opportunities. They are the cake; synergies are the icing.
- Companies should select affiliations strategically; they're not deal-making. Not all acquisitions and joint ventures can be directed or preplanned. But when unexpected candidates surface, as they frequently do, successful acquirers will have the benefit of an explicit external development strategy — or at least guidelines against which to evaluate the candidate situation.
- Once a strategic partner is in sight, a company should anticipate how the partnership will best function before the transaction is structured. Potential conflicts abound. Most acquireds wish to retain some or all of their autonomy and culture, yet are seeking some sort of strategic assistance. Acquirers have learned that they need to invigorate, not smother or homogenize, firms.

Yet, corporate leadership will want more than an addition to the balance sheet or a new bubble on the corporate portfolio grid. To overcome the potential for conflict, issues of governance, compensation, reporting, mutual assistance and cultural independence should be agreed upon before the deal is struck.

About the author

Harvey Poppel is a partner in Broadview Associates of Fort Lee, N.J., a merger and acquisitions consultant to companies that are in the information services/software industry or seek participation in it. Poppel came to Broadview from Booz, Allen & Hamilton, Inc., a management consulting and technology firm, where he was a senior vice-president and a managing officer of the information industry practice.

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Understanding the DP professional

A primer for the wives, husbands, friends and lovers of people who speak computerese, Part 2

Last week, Part 1 of this two-part series interpreted the language of computer professionals for laymen. Part 2 describes the various jobs that make up data processing. Why not tear this article out and share it with someone who doesn't speak computerese.

By Bruce Kula

Phyllis is one of four systems analysts who work for the First National Bank of Erehwyna. This morning, Phyllis is meeting with Harriet, the supervisor in filing.

Harriet has a problem. Every day she receives a list of the files required by bank employees (employee files for the personnel department, financial information on clients for the loan department and so on), which Harriet's clerks try to locate.

If a desired file isn't on their shelves, Harriet finds out its location, then fills out a card with that information and the date the file should be returned (it's a bank policy that no one may keep a file for more than a week). Every day, Harriet shuffles through her cards to ascertain who must be notified that day that they have held a file too long that someone else requires. Harriet explains all this to Phyllis, who happens to have no prior knowledge of the way things work down in the filing department.

As Phyllis listens, she detects a bit of jealousy on Harriet's part — most other departments have computer terminals to help them do their work, but filing is still doing everything by hand. Harriet's knowledge of computers is as vague as Phyllis' knowledge of filing, but she realizes a computer would help her keep track of her files better, which would allow her more time to address more important tasks.

Phyllis hears jealousy, perhaps, because she has a good ear for what people really mean, even when the people have some trouble expressing themselves. Phyllis thinks of herself as a people-oriented person, as opposed to some of her colleagues, whom she considers (rightfully so) more computer-oriented.

So as Phyllis heads back to her desk, her head filled with new information about the filing department, she is thinking about two problems: first, increasing the efficiency of filing by

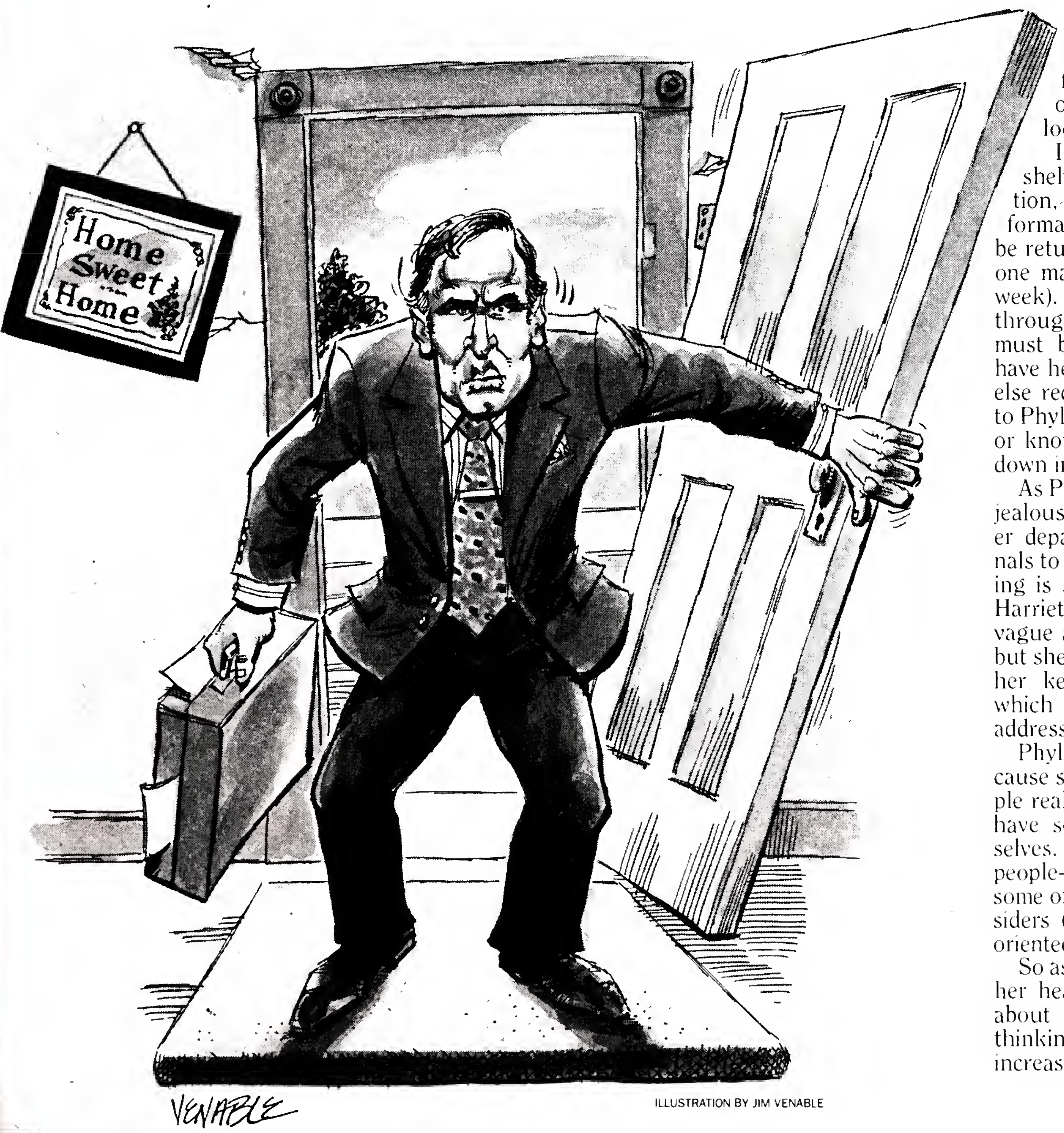

ILLUSTRATION BY JIM VENABLE

automating their procedures (giving them access to a computer system for tracking files); and second, giving filing a system that will make the department more satisfied. It isn't hard to automate procedures in such a way that things are worse than they were before. In fact, the most biting insult one can give a systems analyst is probably, "We were doing it faster before you put it on the computer."

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> *The most biting insult one can give a systems analyst is probably, "We were doing it faster before you put it on the computer."*

Phyllis sits down at her desk and thinks. She might just sit and think for the rest of her working day, without so much as committing a word to paper. But this filing problem doesn't happen to be very difficult, and she starts sketching a flowchart after a few minutes. Her first flowchart has boxes and arrows, representing what kind of information filing has to keep track of, where they get it and what they do with it. Then she scribbles a second flowchart. This one has special symbols for devices in the computer system, such as a terminal, disk storage and so on. Finally, she works on a very complicated flowchart that represents the way programs in her imagined filing system will work.

Not all systems analysts use flowcharts, but Phyllis was trained that way, and she finds they help her think about how a system should be put together. She also finds it is a good way to express to a programmer how the system will be written.

By the end of the day, Phyllis has the specifications for a system that she thinks will work well for Harriet. She starts a memorandum to her boss, describing in a general way how her system will work and how much time it will take to design, write and test it. Her boss will look over her proposal and make a decision: Will the cost of assembling an automated system for filing be justified by its advantages? Phyllis' understanding of people will serve her in good stead, since it helps her to write a very convincing proposal.

Phyllis has an excellent general understanding of how a computer system works, but she couldn't explain it in a technical way. She's more interested, really, in the way people work.

Phyllis makes $37,000 per year.

Applications programmer

Jack is one of a dozen applications programmers at First National of Erehwyna. He works very closely with Phyllis some days: She describes for him what he has to do, and he does it. But Phyllis is not Jack's boss, even though she makes a little more money and has a few more years' experience. She might be thought of as an architect and Jack as a builder — equal partners, in a way.

This morning Phyllis has handed over a sheaf of documentation to Jack, all of which has to do with a new automated system for the tracking of files. Phyllis has gotten approval for the project and has put together a formal design and all the other information Jack will need to write the programs for the system. After an hour or so, Jack feels he understands the project well enough to get to work on it.

He leaves the conference room, sits down at his desk, types in his password on his terminal — and his phone rings. It's the computer operator.

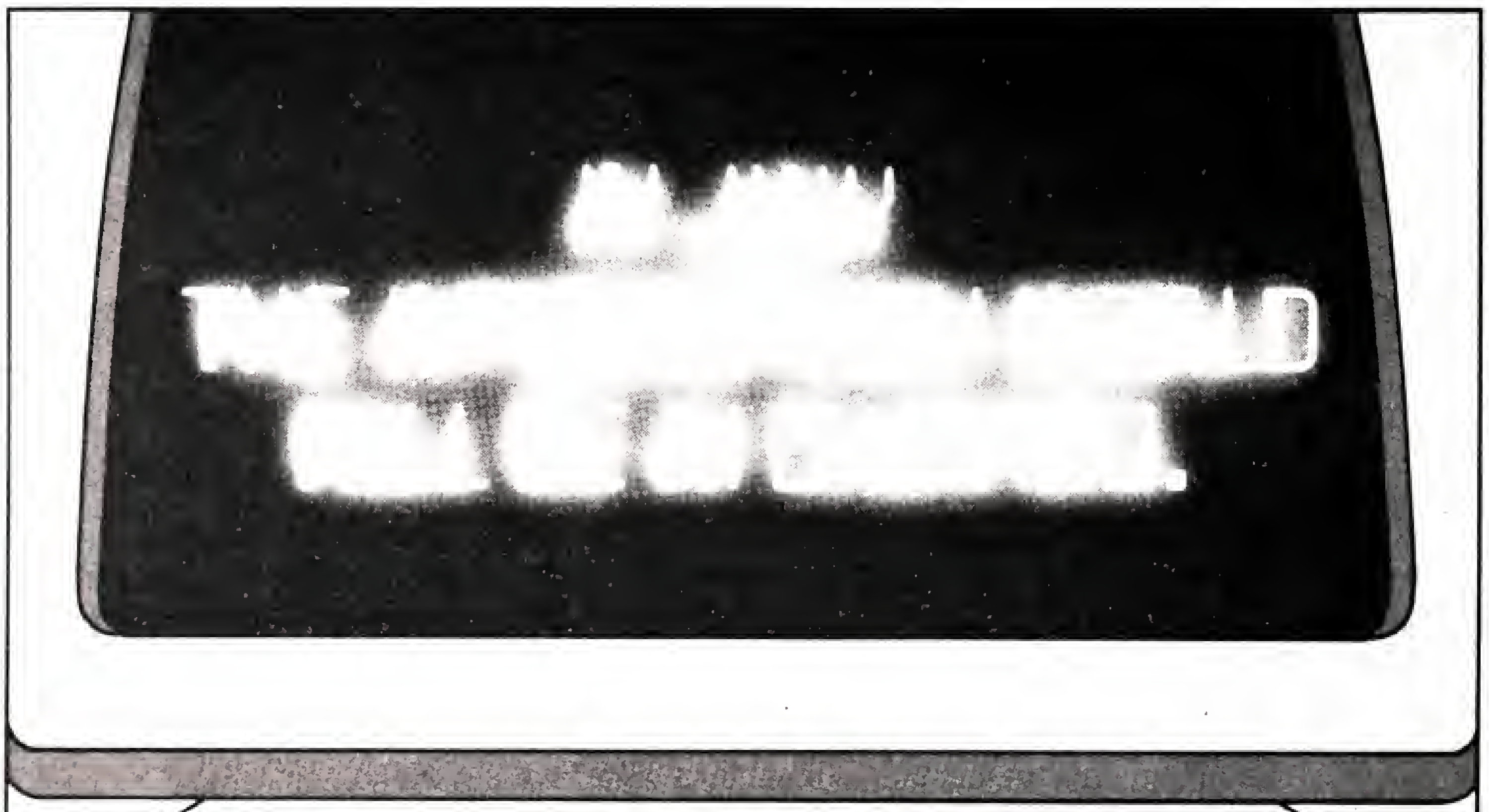
The computer operator informs Jack that the monthly statement system has "blown up on an S0C1 in MSPRT021," which means to Jack that one of the programs he is responsible for requires his attention. It just so happens he didn't write the program that failed, but Jack's boss has assigned responsibility of the monthly statement system to Jack, so when there is a problem with it, it's Jack's problem.

Naturally, the new filing system documentation gets set aside while Jack deals with this new problem. He assembles his tools: a listing of program MSPRT021 in the language the original programmer used when he wrote it (the source code), a listing of computer storage as it looked when the program failed (the dump) and his computer terminal.

From the source code listing, Jack ascertains that no one has changed the program lately — the most recent change occurred two years ago. He looks at the dump and calculates where the program began in computer storage and where it failed. Subtracting the second hexadecimal address from the first, he figures out exactly what instruction was being executed when the program died. Going back to the source code (which he understands better than the machine code of the dump) he discovers the program was working on calculating the day of the week — Sunday through Saturday — from the Gregorian date (which happened to be February 29).

Tricked by leap year

Now Jack is suspicious because, as all programmers know, routines that process a date must take into account the possibility of leap year. A little more checking through the program confirms his suspicion: Program MSPRT021 was written without regard for the fact that February sometimes has 29, not 28, days. The



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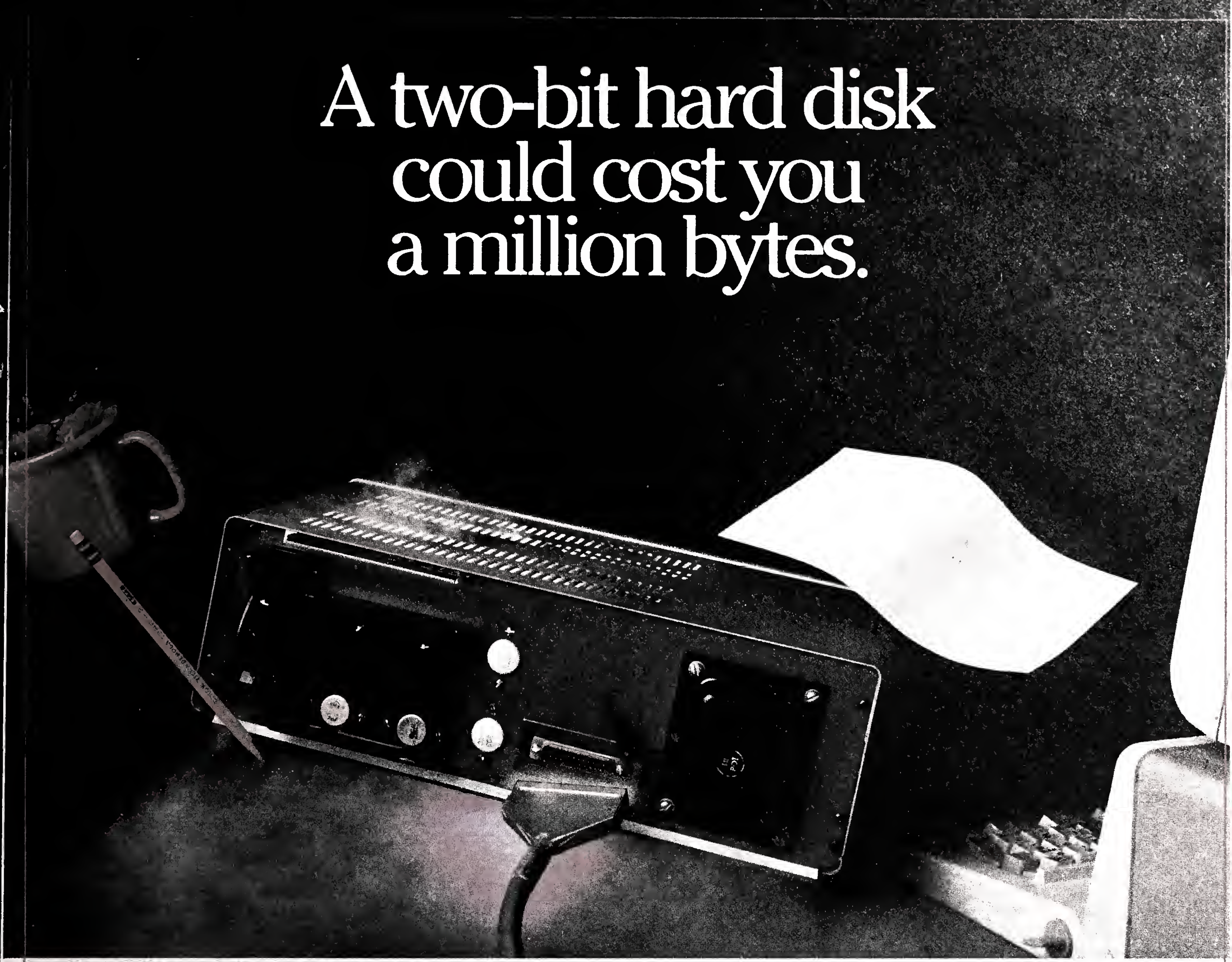

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routine for figuring the day of the week was confused by the fact that the day after February 28 was not March 1, and faced with what it considered an impossibility, abended — came to an abnormal end.

Turning to his terminal, Jack types in the commands that allow him to fix the source code so that a leap year is recognized as a possibility by MSPRT021. Then he runs the job to translate the program into machine code. Lastly, he tries out the program to make sure he has really fixed it. It turns out he has: The program goes to normal EOJ — End Of Job.

Now there are forms to be filled out: first, a problem report, explaining what went wrong and why and what Jack did to fix the problem. That will go to the computer room supervisor. Next, a form describing the changes Jack has made to program MSPRT021, a line or two averring that Jack has thoroughly tested his fix and a request that his new version be given production status. That will go to the data processing department librarian, who will move the program to the proper computer library for tested programs.

And the filing system Phyllis turned over to Jack? That must wait until tomorrow.

Jack makes $33,000 per year.

Computer operator

Usually, there are two computer operators on the day shift at First National, but Jim has called in sick, so Elaine will be handling the computer room by herself today. That's the first thing she learns when she comes to work. The second thing she learns is that she is going to have some extra jobs to run today. It seems a mechanical failure of a printer caused some jobs usually run on the night shift to be deferred. The printer has been repaired.

Elaine finds all this out by looking at the turnover sheet, a document used at First National to allow communication between operators from one shift to the next. Of course they can also talk to each other, but the turnover sheet provides permanent documentation and helps ensure that an operator just starting work has all the information required to do his job.

Next, Elaine checks her job schedule. This schedule lists jobs that must be run during her shift, in order by time and priority, along with any special procedures involved. She notices, for example, that someone has requested that last month's Interest Experience Reports should be printed again; that means she must use last month's information (stored on tape) instead of the current month's.

The First National's computer room has two display terminals: one is the computer console, which Elaine uses to communicate with the computer about which jobs are running, which jobs should be initiated, which tapes should be mounted on tape drives, which forms should be mounted on printers and so on; the other allows Elaine to monitor the status of the operating system and the system that controls user terminals.

At this second terminal, Elaine can, for example, ascertain how many people are using their terminals at any given moment and whether their response time — the amount of time it takes for the computer to respond to their requests — is at an acceptable level.

At First National, users expect to see a screenful of data within three seconds after they type in a request. Elaine checks her system and discovers average response time is currently 0.2 seconds, which is very good, but to be expected at 8:00 a.m. when few users are on the system. At 10:00 a.m., she knows, average response time will be more like 2.9 seconds, because about 40 people will be using terminals at the same time.

Getting things moving

Elaine submits her first jobs of the day to the system. For some of these she uses a card reader, some she initiates by typing commands on her console. The programs start running, under the control of the operating system, which will send messages to the console screen if the programs require any human intervention, such as the mounting of tapes or forms, from the operator.

Elaine happens to know the jobs she has submitted will chug away in the computer for an hour or so before anything more is required of her, so she sets to work on some of the maintenance tasks for which she is responsible. The tape drives have to be cleaned occasionally to work properly, and the printers, which collect paper dust from the forms fed through them, must be thoroughly vacuumed. New tapes must be labeled, and new computer room documentation must be filed.

At 9:30, Elaine makes a quick check of the system, alerts the computer room supervisor and takes a welcomed coffee break. She is not allowed to smoke, drink or eat in the computer room. Smoke molecules from a cigarette could keep a disk drive from reading data properly, and a spilled cup of coffee could disable a computer worth millions of dollars.

When she returns to the computer room, Elaine notices a message on the console: A program in the monthly statement system has failed, and the operating system has diagnosed and reported the problem. Elaine goes to a list tacked to the bulletin board and discovers that Jack is the programmer responsible for the monthly statement system. She telephones him; he requests a dump. Back at the console, she finds that the operating system has saved about 300 pages of output from the failing job. She types in a command to start printing the output, which

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she eventually will tear off the printer and give to a data control clerk, who will put the listing in a box marked "Programming Staff," from where it will be collected by a secretary, who will drop it on Jack's desk.

Then, of course, there is a form to fill out: Elaine must write up a problem report to document what happened.

There are some operators, like Elaine's assistant, Jim, who enjoy being computer operators and wouldn't change jobs for the world. Elaine, however, has different plans. She is taking night classes to earn a degree in computer science, in the hope that she will be selected for the next opening for a programmer trainee on First National's programming staff.

She won't make much more money as a novice programmer, but Elaine has an interest in, and an aptitude for, the technical side of computers. Her goal is to become a systems programmer.

Elaine makes $23,000 per year.

Systems programmer

Richard is the most experienced of the four systems programmers at First National of Erehwyna, with six years worth of systems programming experience behind him. Before he became a systems programmer, he was an applications programmer.

As applications programmers gain seniority and skill, they often have to come to a decision about which way to go in their careers. Phyllis, who was an applications programmer at the same time as Richard, decided that she had little interest in the computer itself and worked to become a systems analyst.

Richard, on the other hand, devoured every tidbit of information he could find about computers and operating systems, built his own home computer, subscribed to two computer publications and became a systems programmer. Unlike Phyllis, Richard could describe in great detail how the system worked. When Phyllis speaks of the operating system, she says "the system"; when Richard speaks of it, he says "my system."

Toughest time

Of all the technical people at First National, Richard believes he has the toughest time explaining to an outsider what he does for a living. The last program he wrote was a fairly complicated assembly language program that collected statistics about how the system was working, which allowed Richard, the other systems programmers and the operator, to view the status of the system on a terminal and to keep an eye on such indicators of the system's health as average response time. He explained the program to a friend, who understood it fairly well after 45 minutes, at which point she fell asleep.

Even though Richard's programs are a little difficult to describe, what is worse than that is the fact that even though his title is systems programmer, he really very seldom writes a program. This month, for example, Richard is installing a new version of a tape management system, which will not require writing any programs. This system keeps track of what information is on the thousands of tapes First National has.

Richard has finished reading the documentation that came with the new system, which included three thick manuals, a 20-page document describing installation procedures and a 40-page document describing problems with the new system. Today, Richard will go through the list of problems again very carefully and fix any problems that might affect the tape management system when it runs at First National.

Any new software that Richard installs is likely to have something wrong with it, no matter how much the bank paid for it or how reputable the software vendor is. This is because computer installations vary widely from each other in their mixes of hardware and software. Depending on the environment, a perfectly good program may go awry. Therefore, software vendors often will ship software with a list of warnings, alerting the systems programmer that such and such an environment requires this or that change in the installation procedure or in the software itself.

Sometimes the new software is put on tape and made ready for shipment before a problem crops up, and the vendor will provide only a description of the problem, some way to fix it once the software is installed and the promise that future versions of the software will be sold with the problem fixed.

The first problem Richard reads about says "Multiple volume output files cause excessive label processing time at 1,600 BPI." Richard knows nearly as much about the hardware environment at First National as the software environment and realizes this problem will not affect his system. He makes a note to himself at the top of this page: "Fix not applied."

The next problem reads "24/31-bit dual-mode processing may cause register corruption resulting in abend when multifile volume used for input." This gibberish makes perfect sense to Richard, who writes "Fix applied 29 Feb." at the top of the page and starts typing at his terminal. The software vendor has provided a way to get around the problem of register corruption by changing the code of one of the programs in the tape management system.

In this case, Richard cannot make a change to the program in the same way Jack makes a change. Jack changes source code, the language of programmers; Richard changes object code, the language of computers. Richard will make his changes using a program that accepts hexadecimal

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numbers, not English-like statements, as input. The reason for this is that the purchased tape management system is sold only in the form of object code. The vendor refuses to sell source code, which could be plagiarized more easily by other software companies than the object code could.

Richard, unlike Jack, will not test the change he makes. Usually, he takes the software company at its word that a particular fix will solve a particular problem. Anyway, the systems Richard works with are normally so complex that Richard could not possibly find time to test all their functions. Even the software vendor probably has not done that. Richard will install a system, try out a few of the major facilities the system provides and, if they work, he'll consider his job done.

Unfortunately, when one of Richard's systems doesn't work, nearly everyone at First National finds out about it — because failing systems software makes it impossible to use the computer. For that reason, he gets more phone calls in the middle of the night than any other programmer at First National.

Richard is paid $37,000 per year.

Software engineer

Susan is employed by Tape Management Systems, Inc. (usually known as TMSI). Her company sold a group of computer programs called Supertape to the First National of Erehwyna, as well as 100 other businesses. Supertape can be used to maintain a sort of index of a computer installation's tapes. Instead of a computer operator figuring out which tape to use for a particular job, Supertape will figure it out and write a message to the console screen that says "Mount tape number 4301," or words to that effect. This makes the computer operator's job easier and reduces the number of mistakes that can cause data to be lost. So First National was happy to lease the Supertape system for $2,000 per year.

Susan wrote most of the programs in the Supertape system. When a problem is discovered in the field ("in the field," at TMSI, means "at a customer site"), it is her job to fix it. There are other software engineers responsible for other software that TMSI sells and leases.

TMSI has a system on one of its own computers — the Problem Report System — for keeping track of any trouble that customers have with their software. Susan can go to her terminal every morning and get a pretty good idea of how she will spend her day.

This morning she discovers a problem report submitted by a bank in Erehwyna. The bank uses some tape drives that can only handle one kind of tape: a tape whose data has been recorded at a density of 1,600 bytes of data per inch of tape. When the computer operator inadvertently mounts a tape recorded at a higher density on one of these drives, Supertape should send a message to the operator's console that says, in effect, "Wrong tape drive for this tape." According to the problem report, what actually happens when this situation occurs at the Erehwyna installation is that the whole operating system stops dead. After this minor operator error, in other words, the bank's daily processing is interrupted.

Susan's first step in solving this problem is trying it out herself, to see if the problem occurs as it was reported.

She goes into a laboratory down the hall where a computer and peripheral equipment are available for her (and the other software engineers') use. She starts up a program that will request a tape mount. When the console shows the request, Susan mounts a 6,250 byte/in. tape on a 1,600 byte/in. tape drive. This should cause the system crash described by the customer.

But it doesn't happen that way. On the system console is a message that says, "Wrong tape drive for this tape." As far as Susan is concerned, Supertape seems to be working exactly as it is supposed to work.

At this point, Susan could close the problem as "not reproducible" — a nice way of saying the customer is wrong. But she has gotten problem reports from this bank in Erehwyna before, and it seemed like a professional outfit that would research a problem pretty thoroughly before calling

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> ”
>
> *Almost immediately, Susan is on to something. It seems the bank does not use the same brand of tape drive as TMSI.*

TMSI about it. She assumes the problem is real and that she simply has not been able to imitate the steps leading up to it.

She calls TMSI's customer service department and asks the representative who handles the First National account some questions, trying to ascertain what is different about her test in the laboratory from what is happening at the bank. Almost immediately, she's on to something. It seems the bank does not use the same brand of tape drive as TMSI. A different kind of tape drive could be an eventuality for which Supertape is not prepared.

Hardware (like a tape drive) communicates with software (like Supertape), and the software has to be able to ascertain just what kind of device it is conversing with. Susan surmises that Supertape has not properly identified the tape drive it is communicating with at First National.

She pulls out a program listing and scans through it until she finds the code that checks for tape density mismatches. After a few moments, she sees the problem: Supertape checks the brand of tape drive being used after it checks the density; it should do that before. The language spoken by this different brand of tape drive makes Supertape go on as if everything is all right, leading, a few nanoseconds later, to disaster.

Trial run

At her terminal, Susan makes the changes to the erroneous program. She tests artificially, without a tape drive at all, by sending the program data that looks like the sort of thing a tape drive would send it. Now the program reacts properly.

She fills out a form with the name of the program, the problem she has fixed and a brief description of what she did. This goes to the test group at TMSI, which will recheck her work. Eventually, it will become part of a new version of Supertape, which will be sent to all customers who lease it.

Susan makes $34,000 per year.

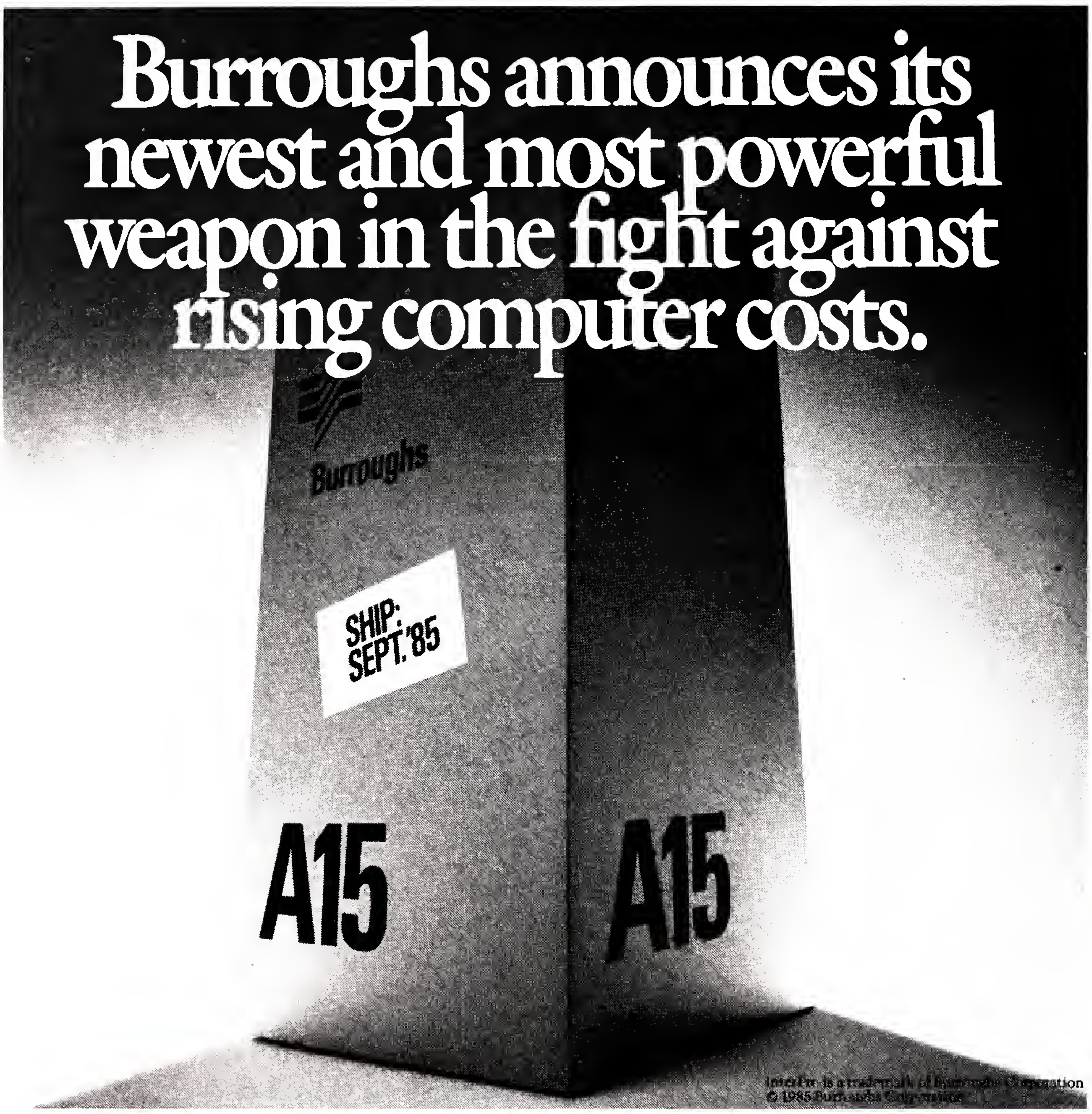
■

Just the surface of talking to and understanding computer professionals has been scratched in these two articles. Many data processing jobs, systems, devices and concepts have been ignored — on purpose.

My intent was to describe things in a general enough way that most of the concepts and terms will apply to any computer installation. Ideally, your friends in DP will expand upon these articles by relating what I've written to their own experiences.

About the author

Bruce Kula is currently a software engineer for Paradyne Corp. in Largo, Fla. He has been a truck driver and a high-speed planer operator in Wyoming and a systems programmer near Detroit. He now lives and writes on the shore of the Gulf of Mexico.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FUSION

Microprocessors

What you need to know

By Stephanie Di Donato

From a user's perspective, the microprocessor is the most distant element of the computer, and a part he might not often consider in a purchasing decision.

The primary rule of microprocessor selection is: Unless you are writing a program in the instruction language of the microprocessor itself, you are interested in the choice of microprocessor made by a computer vendor only insofar as it affects the layers of the system closest to you.

Understanding the selection of microprocessors requires understanding the process as a whole. First, applications programs should be located to serve the particular requirements of the current and projected uses of the computer.

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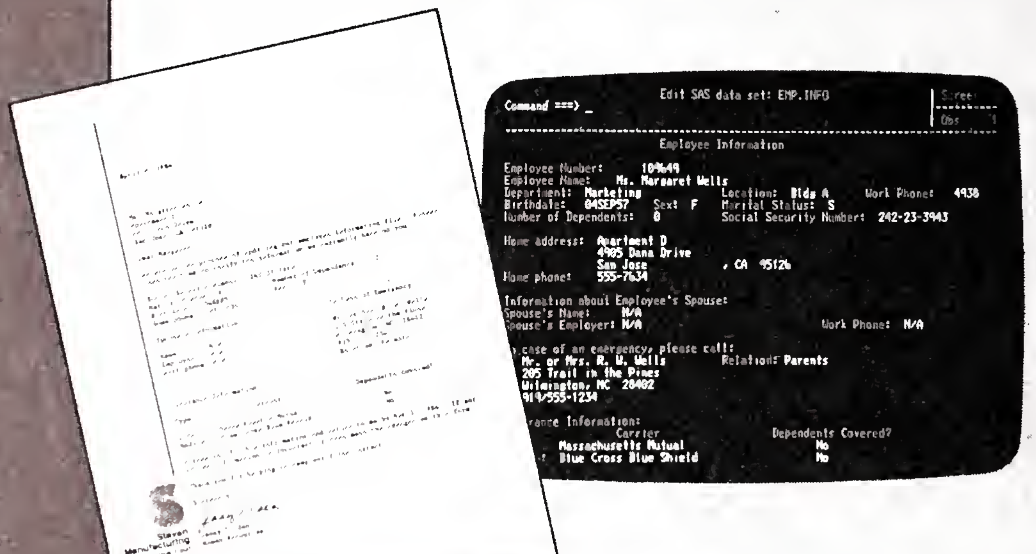

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                         Edit SAS data set: EMP.INFO          | Scree
Command ===> _                                                |--------
                                                              | Obs   1
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                         Employee Information

Employee Number:      104649
Employee Name:    Ms. Margaret Wells
Department:  Marketing              Location:  Bldg A      Work Phone:  4938
Birthdate:   04SEP57    Sex:  F     Marital Status:  S
Number of Dependents:   0           Social Security Number:  242-23-3943

Home address:  Apartment D
               4905 Dana Drive
               San Jose               , CA  95126
Home phone:    555-7634

Information about Employee's Spouse:
Spouse's Name:      N/A
Spouse's Employer: N/A                              Work Phone:  N/A

 case of an emergency, please call:
 Mr. or Mrs. R. W. Wells            Relation: Parents
 205 Trail in the Pines
 Wilmington, NC  28402
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rance Information:
             Carrier                       Dependents Covered?
      Massachusetts Mutual                        No
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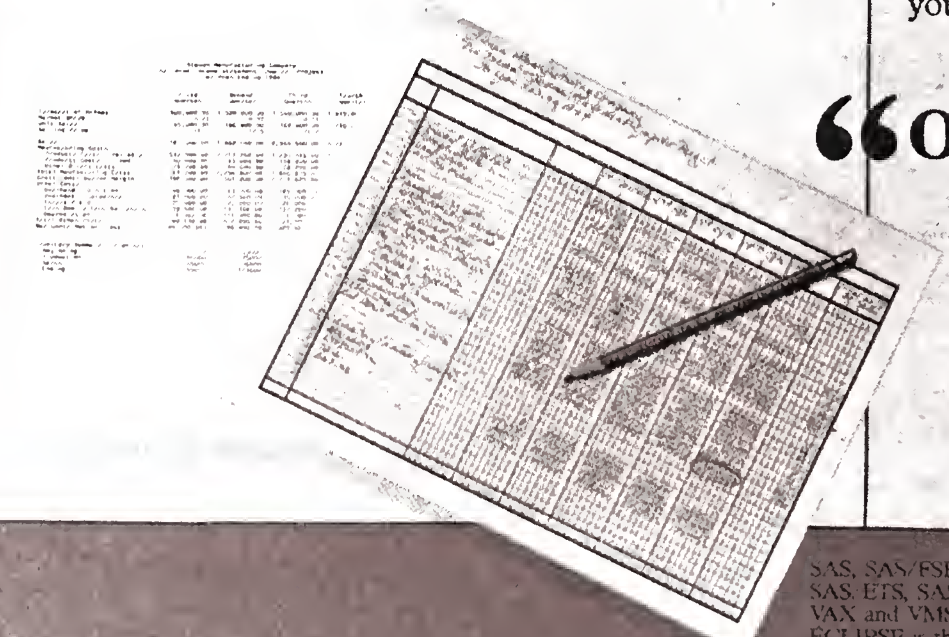

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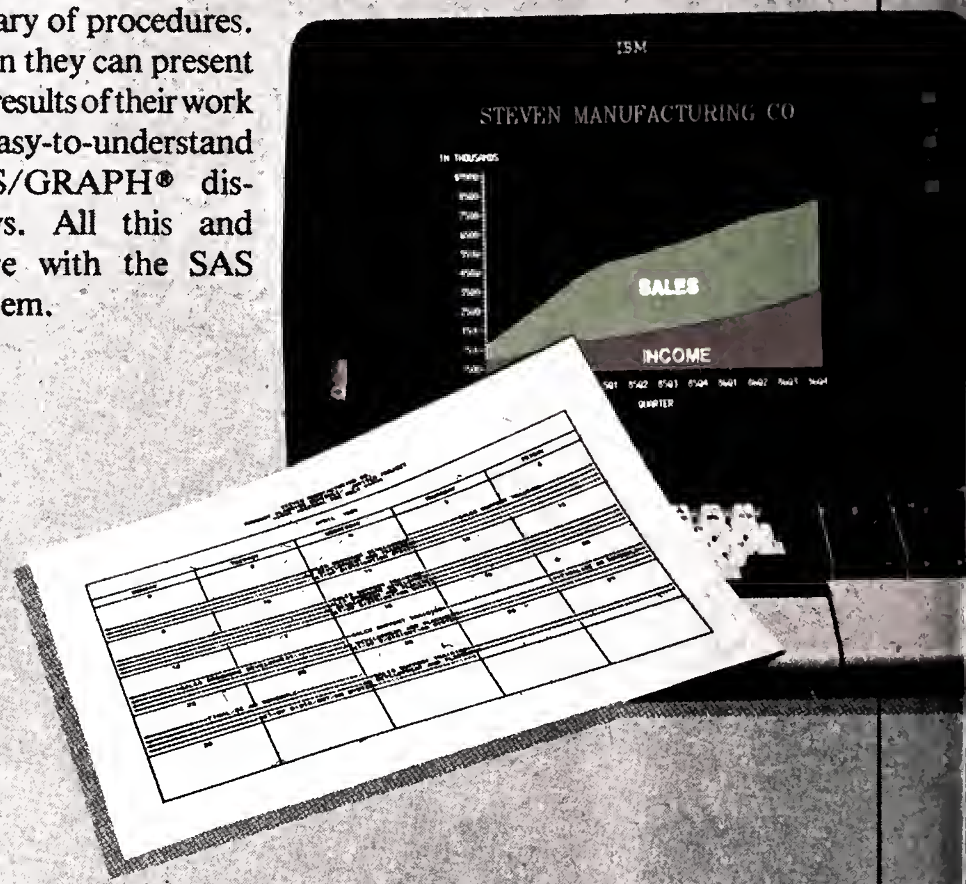

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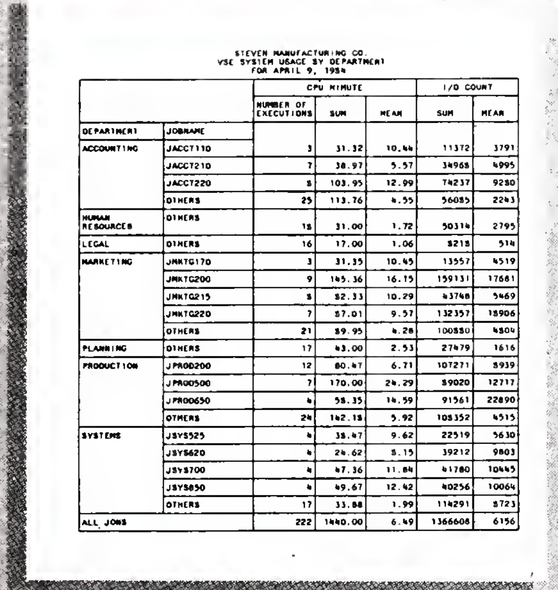

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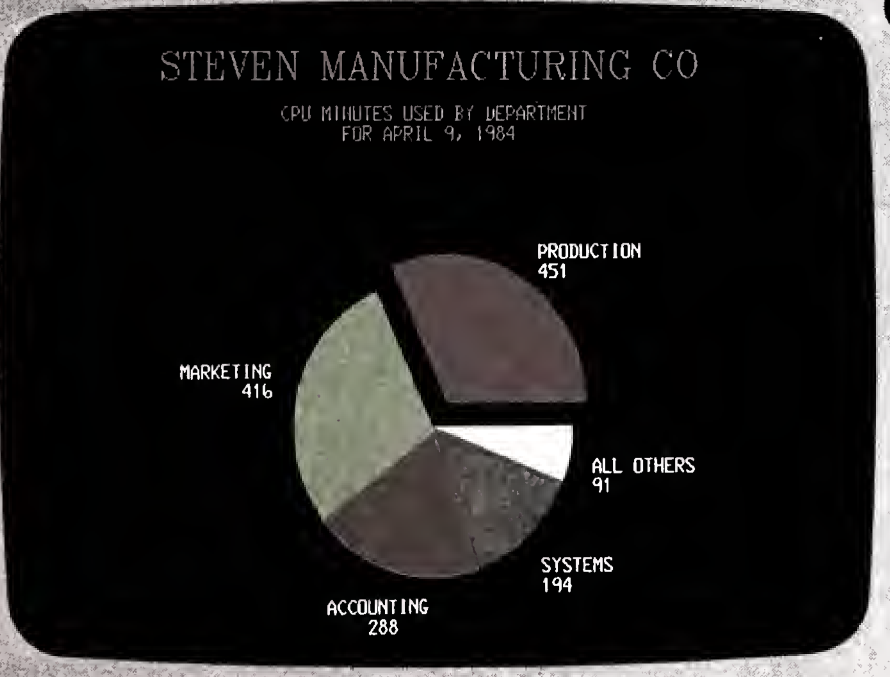
		CPU MINUTE			I/O COUNT	
		NUMBER OF EXECUTIONS	SUM	MEAN	SUM	MEAN
DEPARTMENT	JOBNAME					
ACCOUNTING	JACCT110	3	31.32	10.44	11372	3791
	JACCT210	7	38.97	5.57	34968	4995
	JACCT220	8	103.95	12.99	74237	9280
	OTHERS	25	113.76	4.55	56085	2243
HUMAN RESOURCES	OTHERS	18	31.00	1.72	50314	2795
LEGAL	OTHERS	16	17.00	1.06	8218	514
MARKETING	JMKTG170	3	31.35	10.45	13557	4519
	JMKTG200	9	145.36	16.15	159131	17681
	JMKTG215	8	82.33	10.29	43748	5469
	JMKTG220	7	67.01	9.57	132357	18908
	OTHERS	21	89.95	4.28	100880	4804
PLANNING	OTHERS	17	43.00	2.53	27479	1616
PRODUCTION	JPROD200	12	80.47	6.71	107271	8939
	JPROD500	7	170.00	24.29	89020	12717
	JPROD650	4	58.35	14.59	91561	22890
	OTHERS	24	142.18	5.92	108352	4515
SYSTEMS	JSYS525	4	38.47	9.62	22519	5630
	JSYS620	4	24.62	6.15	39212	9803
	JSYS700	4	47.36	11.84	41780	10445
	JSYS850	4	49.67	12.42	40256	10064
	OTHERS	17	33.88	1.99	114291	6723
ALL JOBS		222	1440.00	6.49	1366608	6156



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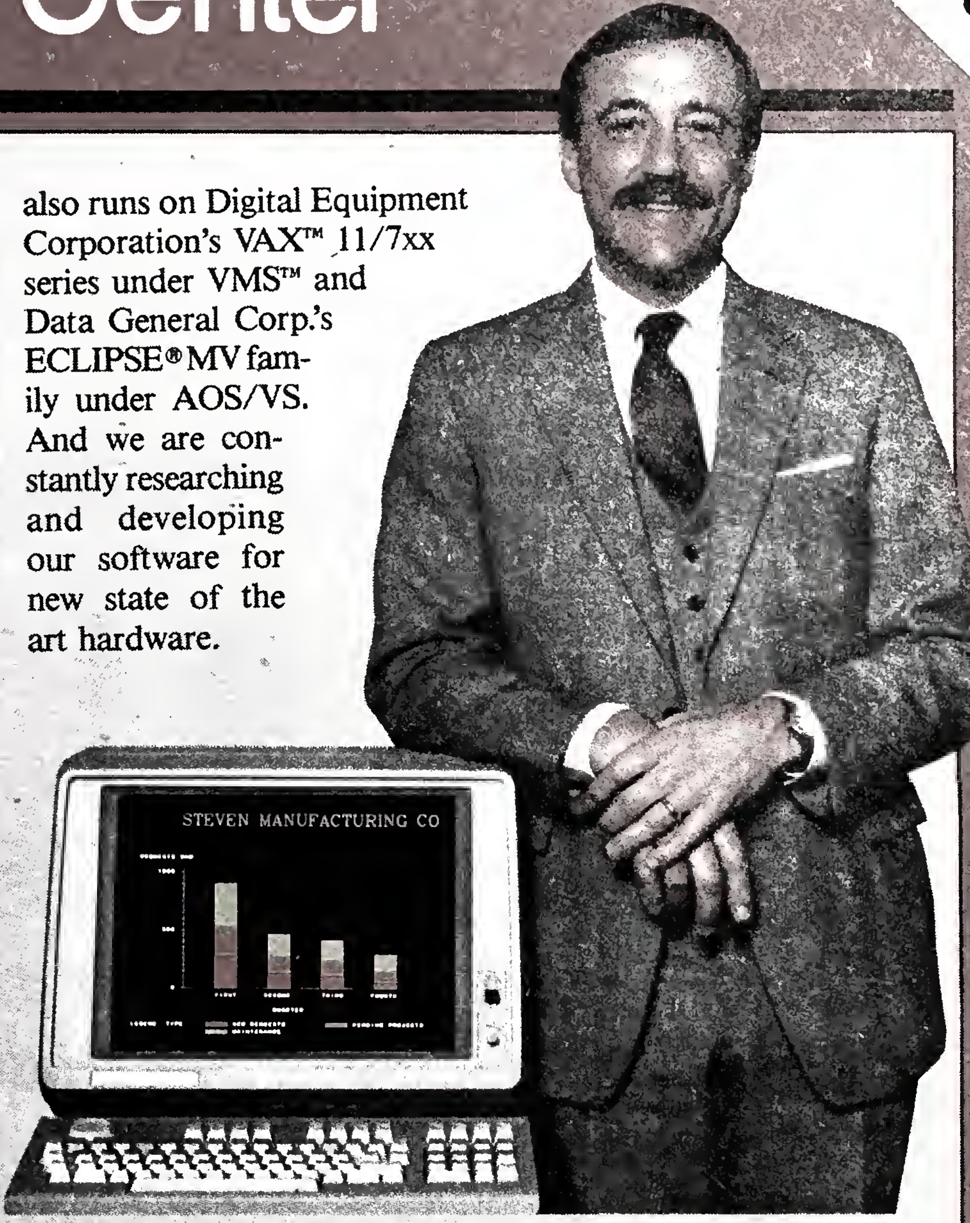

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Second, any programming languages that are required to support those applications should be located. If the application is already translated into computer instructions, this step is not required.

Third, the operating system that is required to run the applications and programming languages must be identified. And finally, the microprocessor type and computer system needed to run that operating system can be considered.

This classical approach is often difficult for a corporate buyer to apply, because the purchase may be contemplated to support a more general decision support or computer literacy goal. Perhaps the organization is preparing for a corporate standard of purchase that must support all applications. In this case, since the applications mix will be unpredictable, it is usually best to consider systems suitable for the widest possible mix of applications.

Here it is possible to apply some indirect microprocessor selection rules. To do so, the buyer should know what microprocessor is used in the products being considered and what is used in the major product offerings in the marketplace as well.

The first question to ask about the microprocessor is how often it is used — not a very technical issue, to be sure, but a very important one. A microprocessor chip used in various products will have many skillful programmers supporting it. More programs will be written for it. Its popularity is an indication of market suitability and of some history of satisfactory performance.

Finally, other people with the same selection to make have obviously chosen it. While corporate purchasers should not rush off with the crowd, they should be cautious when they are on a lonely trail.

The second question about a microprocessor is upward compatibility. This is a little more technical and relates to whether the microprocessor is a member of a family of products that provides for performance growth but retains the same basic instruction set and operating concepts. Buying the last or largest of anything leaves nowhere to go but down.

The final question to ask, and the question to be asked only if the process to this point results in more than one candidate, concerns the technology of the product. The evaluation of microprocessor technology is something best left to computer scientists; if at all possible, a team should participate in any decision that gets this far.

The team should include managers and business professionals. Specialists tend to select technologies that are interesting, topical and modern, not necessarily practical. Managers and business professionals should probably control the selection process.

Instruction sets

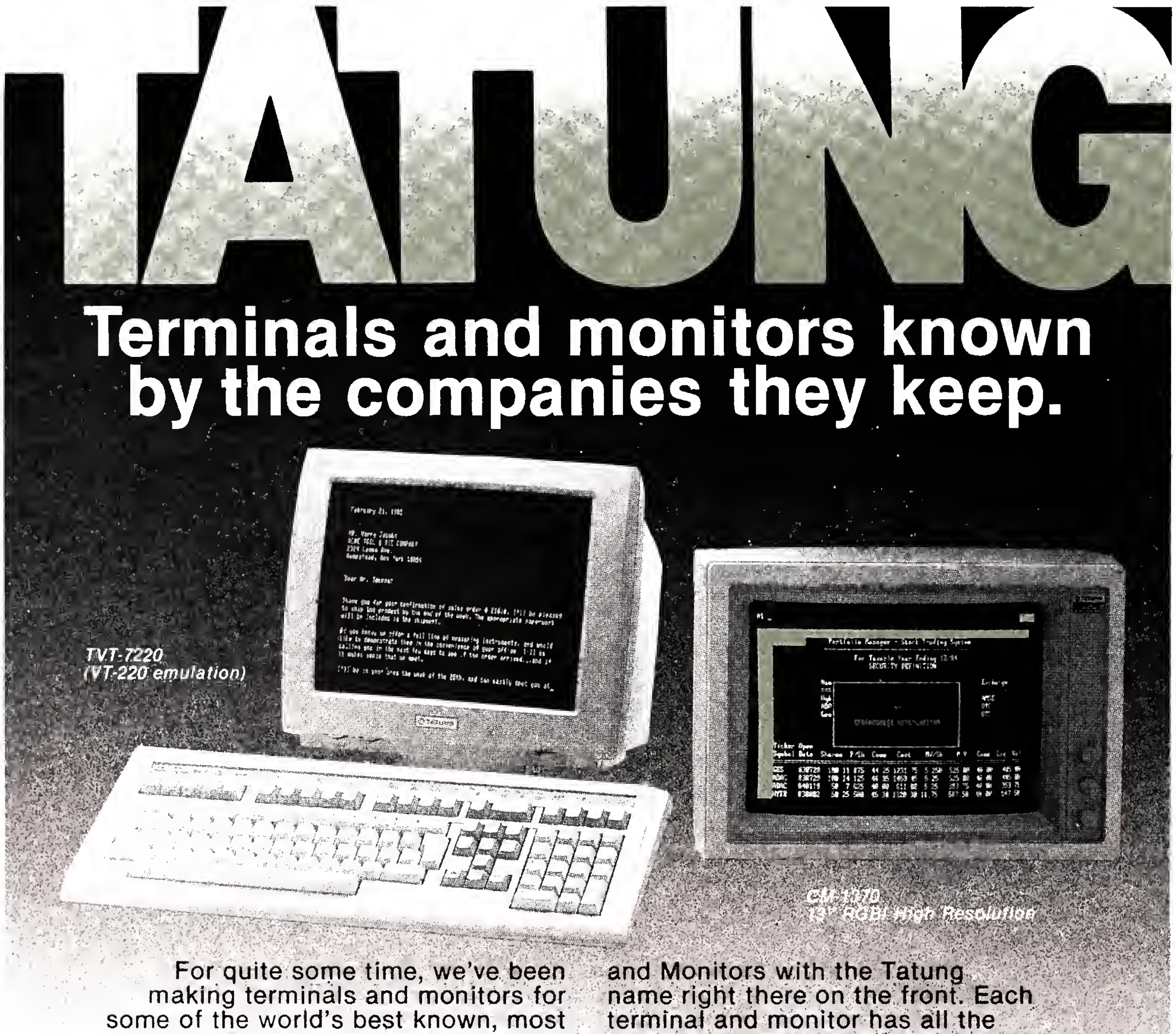
One area in which users often are misled is the power of instruction sets. Some microprocessor products have flexible and sophisticated instructions, and using those instructions may improve the performance of a given business application significantly. Users may even select a microprocessor based on the ability to support floating-point calculations directly through custom instructions.

Unless you intend to program directly in machine (or assembly) language, be sure that the language you select will use any special instructions before you buy a microprocessor that supports them. You might think that any language written for a computer would support all the instructions available on its microprocessor, but they do not.

The primary grouping of microprocessors is by the width of the data bus — the only meaningful measure of bit size.

Thus, the Intel Corp. 8086, the

> ”
>
> *While corporate purchasers should not rush off with the crowd, they should be cautious when they are on a lonely trail.*



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A Survey of Microprocessors

		DATA PATH WIDTH			MEMORY SUPPORTED					FEATURES					OPERATING SYSTEM CAPABILITY					FULL PROGRAMMING LANGUAGE SUPPORT
Product	**Developer**	8 bits	16 bits	32 bits	Less than 1M byte	1M byte	2M bytes	8M bytes	16M bytes or more	Real memory addressing	Virtual memory addressing	Floating-point instruction	Packed decimal arithmetic	Arithmetic co-processor	CP/M 8 bits	CP/M 16 bits	MS-DOS	Unix	Others	
Microvax	DEC	–	–	●	–	–	–	–	–	–	●	–	–	–	–	–	–	●	●	–
NCR 32-000	NCR	–	–	●	–	–	–	–	●	●	●	●	●	–	–	–	–	–	●	–
NSC 800	National Semiconductor	●	–	–	●	–	–	–	–	●	–	–	–	–	●	–	–	–	–	●
WE 32000	AT&T Technologies	–	–	●	–	–	–	–	●	●	●	–	–	–	–	–	–	●	–	–
WE 32100	AT&T Technologies	–	–	●	–	–	–	–	●	●	●	–	–	–	–	–	–	●	–	–
Z80	Zilog	●	–	–	●	–	–	–	–	●	–	–	–	–	●	–	–	–	–	●
Z800	Zilog	●	–	–	–	–	–	–	●	●	●	–	–	–	●	–	–	–	–	●
Z8000	Zilog	–	●	–	–	–	–	●	–	●	●	–	–	–	–	–	–	●	–	–
Z80000	Zilog	–	–	●	–	–	–	–	●	●	●	–	–	–	–	–	–	●	–	–
6502	MOS Technology	●	–	–	●	–	–	–	–	●	–	–	–	–	–	–	–	–	●	–
65C02	MOS Technology	●	–	–	●	–	–	–	–	●	–	–	–	–	–	–	–	–	●	–
6809	Motorola	●	–	–	●	–	–	–	–	●	–	–	–	–	–	–	–	–	●	–
8085	Intel	●	–	–	●	–	–	–	–	●	–	–	–	–	●	–	–	–	–	●
8086	Intel	–	●	–	–	●	–	–	–	●	–	–	–	–	–	●	●	●	–	●
80C86	Harris/Intel	–	●	–	–	–	●	–	–	●	–	–	–	–	–	●	●	●	–	●
8087	Intel	–	●	–	–	–	–	–	–	●	–	●	●	●	–	–	–	–	●	–
8088	Intel	●	–	–	–	●	–	–	–	●	–	–	–	–	–	●	●	●	–	●
80C88	Harris/Intel	●	–	–	–	–	●	–	–	●	–	–	–	–	–	●	●	●	–	●
32008	National Semiconductor	●	–	–	–	–	–	–	●	●	–	●	●	–	–	–	–	●	–	–
32016	National Semiconductor	–	●	–	–	–	–	–	●	●	●	●	●	–	–	–	–	●	–	–
32032	National Semiconductor	–	–	●	–	–	–	–	●	●	●	●	●	–	–	–	–	●	–	–
68000	Motorola	–	●	–	–	–	–	–	●	●	–	–	–	–	–	●	–	●	–	●
68000FN	Motorola	–	●	–	–	–	–	–	●	●	–	–	–	–	–	●	–	●	–	●
68008	Motorola	●	–	–	–	●	–	–	–	●	–	–	–	–	–	●	–	●	–	●
68010	Motorola	–	●	–	–	–	–	–	●	●	●	–	–	–	–	●	–	●	–	●
68012	Motorola	–	●	–	–	–	–	–	●	●	●	–	–	–	–	●	–	●	–	●
68020	Motorola	–	–	●	–	–	–	–	●	●	●	–	–	–	–	●	–	●	–	●
68200	Motorola	–	●	–	●	–	–	–	●	●	–	–	–	–	–	–	–	–	●	–
68881	Motorola	–	–	●	–	–	–	–	–	–	–	●	–	●	–	●	–	●	–	●
80186	Intel	–	●	–	–	●	–	–	–	●	–	–	–	–	–	●	●	●	–	●
80188	Intel	●	–	–	–	●	–	–	–	●	–	–	–	–	–	●	●	●	–	●
80286	Intel	–	–	●	–	–	–	–	●	●	●	–	–	–	–	●	●	●	–	●
80287	Intel	–	●	–	–	–	–	–	–	●	–	●	●	●	–	–	–	–	–	–
80386	Intel	–	–	●	–	–	–	–	●	●	●	–	–	–	–	●	●	●	–	●

National Semiconductor Corp. 32016 and the Motorola, Inc. 68010 are all 16-bit systems.

Some of the chips shown in the table at right, such as the AT&T WE 32000, are not normally available for commercial development but are proprietary to the manufacturer. Evaluations of products containing these special processors should not be made directly by users without specialist or engineering support, and they are included for information purposes only.

The 8-bit computers based on the MOS Technology 6502 (primarily the Apple Computer, Inc. Apple II) and the Zilog, Inc. Z80 (the various computer systems based on Digital Research, Inc.'s CP/M) dominated the market as recently as three years ago. But the marketplace has moved to 16-bit products, and most research and software writing efforts are going in that direction. The 8-bit products purchased today still have plenty of applications and software, however.

The most popular 8-bit microprocessors available today are the following:

6502. The oldest of the current popular chips, the 6502 is known primarily for its use in the popular Apple II. The 6502 is reasonably fast and inexpensive, but it has a limited instruction set and an address space of 64K bytes. There have been several efforts to extend this address space to 128K bytes through memory management, most notably with the Apple III (which has been discontinued). With the large base of Apple II computers and a lot of software for them, this chip family, including the 65C02, is therefore likely to have the best future of the 8-bit products.

Z80. A chip developed (and a name trademarked) by Zilog, the Z80 was designed to extend the instruction set of the older Intel 8080 processor. It has a compatible superset of the 8080 instruction set and, because of that, inherited the operating system developed for the 8080, CP/M. The combination was the hottest in the business marketplace, never approaching the total volume of the Apple II but capturing many of the complex applications and enjoying an excellent reputation among businesses and professionals who wanted the closest thing to a "real computer." The IBM Personal Computer, however, has damaged this market. There is no single dominant market leader among the Z80's vendors and no hope that it will be much of a factor in the future.

The 32-bit microprocessors, the newest products, are at the other end of the range. Are they the wave of the future? Certainly, but the question is, how far off is the future? There has not been time for a market consensus to develop on 32-bit chips only a few are even getting built into products. The best prospects in the 32-bit market are those that are generally compatible with their 16-bit ancestors, because programs for them can be made more readily available when (and if) they come into commercial production.

Other good prospects are the chips that provide a compatible architecture to an existing minicomputer, such as Digital Equipment Corp.'s Microvax.

68020. This chip is the Motorola champion of 32-bit systems, and in fact is probably the premier 32-bit processor based on the fact that many people think that the whole 68000 line is 32-bit (it isn't, unless you care to accept a fairly arbitrary standard of measurement, the internal bus size). Like the rest of the family, the 68020 is an upward-compatible enhancement of earlier products.

Packed decimal instructions have been added to the product to improve its business math performance, and a math co-processor is available to improve floating-point operation. Since the 16-bit Unix implementations will migrate to this chip with no trouble, and because of its strong virtual memory structure, the 68020 is probably the best bet in 32 bits for commercial success.

80386. Intel's 80386 is still a bit of a ghost, but the product is expected to be another upgrade of the segmented memory architecture of the 80286. While this development provides a processor that is compatible with the earlier products, it probably pushes the segment memory management scheme a little further than most software developers will care to take it. The 386 is supposed to come with a new co-processor for match operations, an improved version of the 8087, but there is some question as to exactly what kind of operations it will support. If IBM continues to go with the Intel family, the 80386 may find good commercial acceptance.

32032. National Semi's 32032 is probably the technical champion of the 32-bit processors likely to see commercial exploitation. The product is fully compatible with the rest of the 32000 line, so mobility of code is assured. The product has a companion memory management chip with virtual memory support, as well as a floating-point chip. Its instructions are compact in comparison with other 32-bit chips, reducing program size (not much of a factor) and speeding execution by reducing the number of instruction bytes that must be pulled from memory (sometimes a significant break on execution speed). The 32032 is already offered in commercial fault-tolerant computer products; it is the only one of the nonproprietary chips to make an appearance in the marketplace.

The 16-bit family is best, at least in today's market. While all of the products shown in the table are sound and useful from a technical perspective, the market has passed by most of them in favor of two: the Intel 8086 family and the Motorola 68000 family.

8086. The parent chip in the popular Intel family, the 8086 is now pretty much in eclipse. A version of the 8086 with an internal structure identical to its parent but with an 8-bit data bus, called 8088, was selected for the IBM Personal Computer. This shot the family to the top of the market charts and prompted Intel to do some new engineering work to keep it there. The effort resulted in the 80186, a form of the 8086 with a few new instructions and with a lot of circuits that were external to the old 8086 built into the new processor chip.

The result is a lower chip count and a lower computer cost, so the 80186 has largely replaced the 8086 in designs that use the 16-bit data path. A newer family member, the 80286, is even faster and has a very

> *Because the newer Intel chips, such as the 80186 and the 80286, use the same interrupt for a different purpose, there could be software compatibility problems.*

flexible memory management scheme.

The biggest handicap Intel has with its series is also its biggest boost: the IBM Personal Computer family. It seems that when Microsoft Corp. developed the PC-DOS operating system for IBM, it used an interrupt on the 8088 that was reserved for use by the hardware in future developments. The use of the interrupt is written into most of the thousands of programs produced later for the Personal Computer. Now, because the newer Intel chips, such as the 80186 and the 80286, use the same interrupt for a different purpose, there could be software compatibility problems.

68000. A Motorola product, the 68000 actually enjoyed a brief lead over the Intel family until IBM made its decision. Unlike the 8086 computer series, which uses segmented memory only, the 68000 has the ability to address up to 16M bytes of memory directly.

The 68000 family is a virtual memory, page-oriented microprocessor. It also has an instruction set that is very similar to that of the popular DEC PDP-11. This combination has made the 68000 the prime target for AT&T's Unix operating system among microprocessors. Unix offers personal computer users an excellent migration path, because it is supported on computers up to the mainframe class. Its primary drawback is the relative lack of good commercial software for Unix.

Most Unix programs are written in the C programming language, an uncommon vehicle for commercial software but a solid language nevertheless. The 68000 comes in several models, the current champion being the 68010. There is even a 68000 with an 8-bit data bus, the 68008, which offers a kind of Motorola 8088 flexibility but has not really caught on. This processor has expanded page-handling capabilities and an improved scheme for pre-fetching instructions so the arithmetic logic unit always has something to work on. Apple Computer's Macintosh family uses 68000 microprocessor chips, but at present both the user and the developer are somewhat insulated from the chip by the language and operating system structure of the machines. If you think you need a 68000 chip for some technical reason, it is highly unlikely that Macintosh will let you get close enough to it.

32000. National Semiconductor's family of microprocessors offers many excellent features but has had little commercial use in microcomputers. The family has members with 8-, 16- and 32-bit data paths, generally upward-compatible throughout the range. The 16-bit chip, the 32032, has the same 16M-byte address space as the 68000, and an accompanying memory management unit offers virtual memory support. The instruction set is considered by many to be the best on a microprocessor, and several computer manufacturers of fault-tolerant systems have based their designs on the National Semiconductor product.

There is a Unix operating system implementation on the 32032, and most of the popular language processors are implemented for it. Given a chance, the 32000 series could be the basis for a very powerful computer system.

Most users should never become involved in technical evaluations of microprocessor chips because there are too many other factors, such as

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languages, applications and operating systems, that are more important and will eclipse the chip technology in an evaluation. Getting into the details of microprocessor features would normally be a consideration only when a long-range view of vendor products is being taken or when the user will be doing machine-level programming.

Chip technology will affect long-range suitability of products, because lack of a clear and easily supported migration strategy on the current chips will ultimately leave users stranded when better products become available.

None of the current 8-bit chips has a solid migration path; they rely on high-level language compatibility rather than machine-level compatibility. Anyone who uses Basic on several systems knows how compatible high-level languages are. The 16-bit chips, on the other hand, all offer a good path for growth into 32-bit technology.

IBM's use of the Intel 8086 family in the Personal Computer is probably the most significant reason that the series continues to grow. If IBM should, at some point, decide to go with a different chip family, Intel's position in the market will probably weaken. It doesn't look as if that is about to happen, though, because IBM has moved to the 80286 with the IBM Personal Computer AT, running under both MS-DOS and Xenix.

Programming at the machine level is a good reason to consider the specific hardware. Most businesses will not find sufficient reasons to justify assembly language programming, but some special communications or device control applications may require it. There is no question that the Intel 8086 family is more difficult to program than the other 16-bit products; the segmentation architecture seems to cause minicomputer and mainframe programmers more transition difficulties than the structures of the 68000 or 32000.

Other factors may affect a programming task on microcomputers, however. Not all computers provide an assembly language (Macintosh does not), and some systems use an internal hardware architecture that restricts some of the features of the microprocessor. Don't select a computer because of the Motorola 68000 virtual memory addressing system to find that the computer vendor did not elect to supply memory management.

The microprocessor field is changing rapidly and growing more complex. Micro buyers may find themselves lured into excessive technical detail when evaluating systems. If your application really demands attention to the microprocessor itself, that level of consideration becomes justified. In most cases, it is not. Developing a basic understanding of microprocessors is desirable for anyone who intends to use or purchase microcomputers, but that understanding should not be allowed to draw business professionals so close to the technology that they forget the application. ‡

About the author

Stephanie Di Donato is a senior editor/analyst for Data Decisions, a market research firm.

This article was excerpted from Microcomputers, *a three-volume monthly updated reference service that features hands-on test results for micro hardware and software products. Trial review copies are available from Data Decisions, 20 Brace Road, Cherry Hill, N.J. 08034.*

SCIENCE/SCOPE

In the 25 years since the birth of the world's first laser at Hughes Research Laboratories, the "light fantastic" has grown from a laboratory curiosity into an indispensible tool in medicine, industry, electronics, data processing, communications, and scientific research. That first laser, built by Dr. Theodore H. Maiman, was operated on May 15, 1960. It used a flash lamp coiled around a solid ruby crystal to produce an intense pulse of red light with a wavelength of precisely 6943 angstroms. Lasers today employ various gases or crystals and operate throughout the electromagnetic spectrum. They are used as tools for cutting, welding, drilling, and marking metals; as alignment and measuring devices; as the sources of signals in fiber-optic communications systems; and as rangefinders and target illuminators in military systems. Promising new medical uses include advanced eye surgery techniques, internal cauterization, and treatment of cancer. Already used in some computer printers, lasers one day will be widely used in high-speed optical computers to process and store data.

Building blocks for what will become an electronics factory of the future are being set in place at Hughes to cut costs in manufacturing airborne radars and other avionics programs. Lasers, fiber optics, remote fiber fluorometry, and advanced optics play a part in an Industrial Modernization Incentive Program (IMIP) contract awarded by the U.S. Navy with Air Force participation. IMIP is a share-the-savings concept to reduce costs of the F-14, F-15, and F/A-18 radar programs by more than $10 million, while improving the quality and reliability of the systems. Three projects employing new manufacturing technology focus on solder joint inspection, metal fabrication inspection, and continuous chemical analysis of solutions used in electroplating printed wiring boards.

An advanced factory management system model, developed by Computer Aided Manufacturing-International and Hughes, will help optimize use of manufacturing resources. The model will address interactions of all work areas within every level of the organization. It will precisely identify department production capacities, queue bottlenecks, and resource flow. Managers now must make decisions without knowing all interactions among workstations, cells, and departments.

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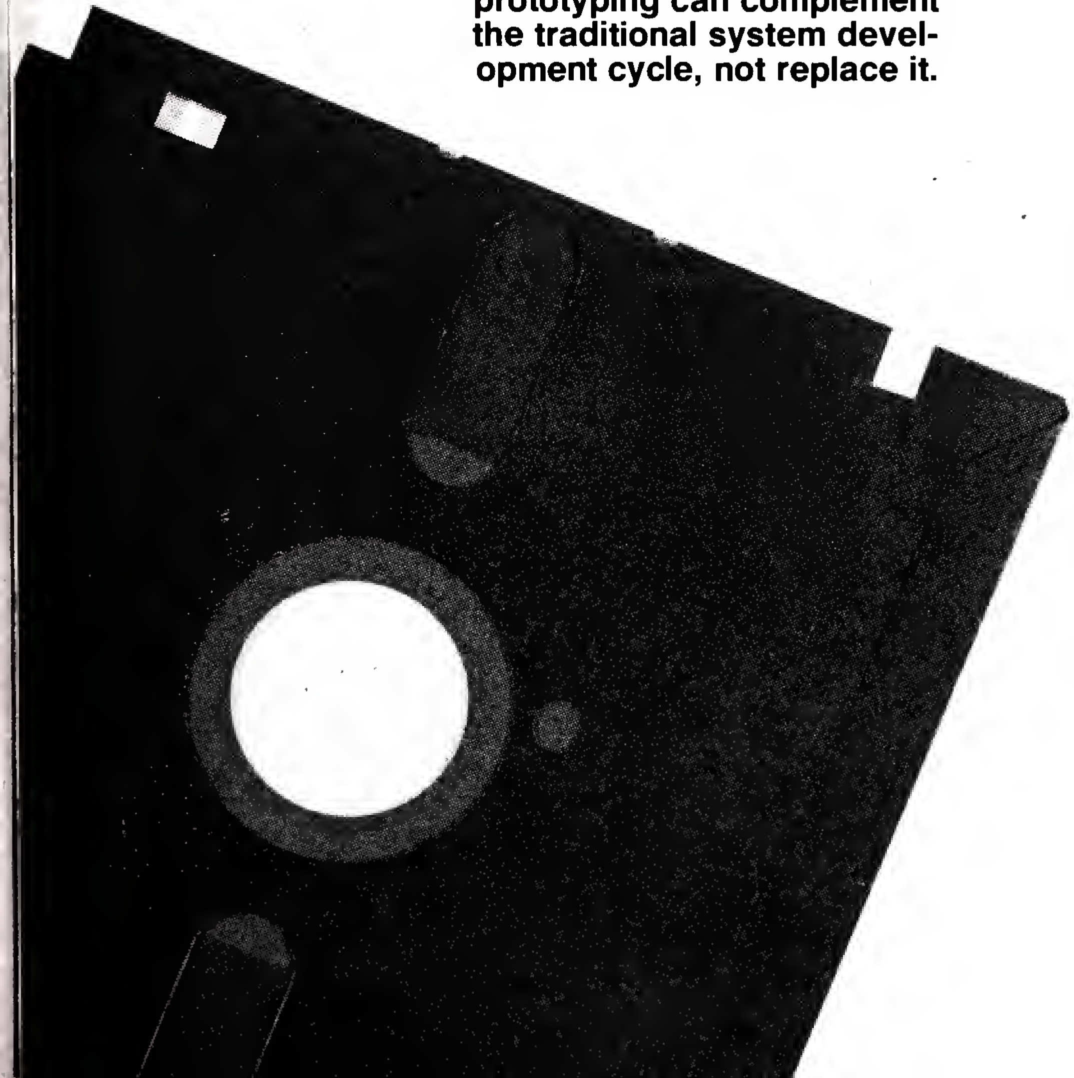


By Lee Adamski

Anyone involved in the development of computer applications has, at least once in his career, seen a tremendous effort go into the design of a system, complete with the latest structured design methodologies, extensive definition of requirements, reams of documentation and end-user sign-offs — only to have the final system turn out to be completely inappropriate for the needs of the users.

This is an extreme example of a system that did not meet its requirements. But really, how many systems are accepted and used as first designed? No matter how much planning and specification are done, what is the first thing that happens when a system finally becomes operational? Request for modification — *Change.* There always seems to be something designers forget.

Prototyping has been defined as the process of building and refining a working model of the final operational system during the development process. In fact, prototyping can mean anything from designing a hard-copy example of a computer report to creating a full-blown computer system with I/O, reports, screens and fully populated data bases.

The use of prototyping in the development of computer applications probably means something different to everyone. Terms such as evolutionary development, iterative enhancement, heuristic development, self-actualizing prototyping, planned evolution, applications simulation, pilot software systems, software breadboarding, evolutionary design, throwaway code, incremental development and the evolutionary life cycle are finding their way into the vernacular of applications designers.

Prototyping has come to mean all of these.

The main purpose of prototyping, however, is to refine the functions and I/O of a system during the design phase, without having to wait for development to be completed.

Is prototyping something new? Not really. Years ago, designers were creating mock-ups of reports, card layouts and, more recently, screen designs.

The idea of throwaway code is certainly not new. Many data processing professionals have all seen their share of programs, design specs and even full systems end up in the trash basket.

What it is not

Prototyping is not a substitute for good analysis and design, nor is it an excuse to abandon proven structured design methodologies, adequate documentation or good programming techniques. And above all, it is not a magical solution to developing systems.

However, if used properly, prototyping can be a very effective tool and a helpful aid in developing systems that meet the needs of users.

The process of developing a prototype is really the same as developing a system except that it's known up front that it may simply be thrown away, and it gets into the users' hands more quickly.

Basic assumptions

If some basic assumptions about the way things really happen are accepted (things that have come to be accepted as "facts of life"), prototyping is seen as a viable method for developing good systems.

It is impossible to do something right, much less perfectly the first time.

How many people have said to themselves, "If I could do it over now, I'd have the perfect system"? That is because experience not only teaches us how to do things, but more importantly, how not to do things.

It is much easier to modify or improve something than to create something from nothing.

Once something is seen, it's easy to uncover its deficiencies or shortcomings. If an analyst is asked to develop a system or a programmer is assigned a program to solve a problem, it will take them some time to come up with a proposed solution. They will research the problem, develop alternative solutions, analyze, design and eventually come up with a solution.

If that same analyst is shown the same problem with a proposed solution, he will immediately respond, "Why didn't you do it this way? You could have. . . ." This is because people are by nature critical. They love to give advice, and they can always come up with suggestions on how to do things better. If someone is asked how to solve a problem, he may not know. But chances are that if he's shown a solution, he will immediately explain why that solution won't work. Many users say "I don't know what I want until I see it," or "Give me an example."

Learning is gradual, iterative and accomplished by example.

People do not learn everything at once. They learn gradually, iteratively and by experience.

For example, a certain company uses an electronic mail system. Few employees know all, or probably even half, of the facilities of this product. Most of the workers learn a few basic functions needed to accomplish a basic task, for example, sending and receiving mail. It is not until a task creates a need for a more advanced function that the function is learned. This appears to be true even for users who took a class where the entire set of functions and facilities was explained. People just seem more comfortable with a gradual assimilation of the system's capabilities.

How do most technicians learn JCL? By reading the IBM manual? By taking a detailed course in JCL? Probably not. More likely by asking a more experienced colleague if he had an existing JCL stream to accomplish a job. Gradually, by doing this, new programmers developed a rather thorough knowledge and understanding of JCL.

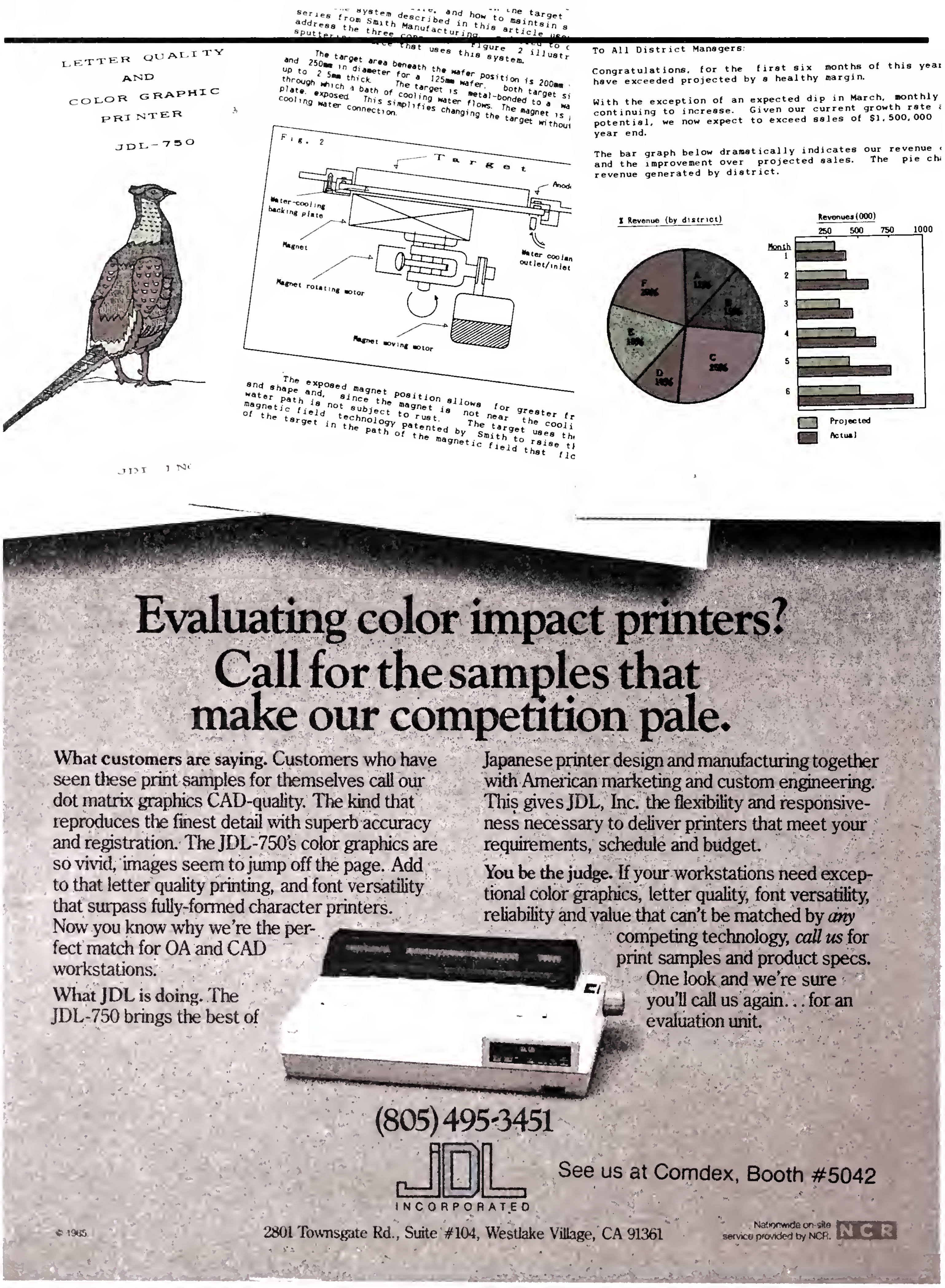
How does all of this relate to prototyping? It points out that one cannot give a user a volume of documentation describing the proposed system or spend an hour or two explaining how it will work and expect him to make a reasonable appraisal of its ability to meet his needs.

A more effective way of eliciting a valid response from a user would be to give him a working model, allow him ample time to play with it, experience it and then ask him to respond.

The trouble starts when the system gets placed in the hands of the user.

The assumption above caused one analyst to observe, "This would be a great job if it weren't for the users!"

The point is that developers can ask users what they want, then sit in their offices and design these great, fail-safe systems they believe are perfect and will meet users' needs. However, it's not until users work with the system that developers find out what users really want.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Users cannot accurately specify systems until they have used them.

Therefore, users should use the system before it's too late.

Anyone who has ever been in the software vendor business knows what a traumatic experience it is to release a product. The greatest minds in software development can produce a product that they think does everything that anyone would ever want it to do — then it's released.

Users, however, being the ingenious, devious people that they are, will find all kinds of ways to use it and abuse it, while uncovering all kinds of functions that it should be doing that its developers never dreamed of. This is because:

The primary catalyst to innovation is people, not methodology.

Below are a few observations by well-respected experts in the systems development field. These statements suggest that there has been trouble specifying systems requirements and communicating effectively with users:

"The document setting out the details of a new system (system specification, general design, functional specification) effectively forms a contract between the user department and the systems development group, yet it is frequently impossible for the user to understand because of its sheer bulk and the technical concepts built into it."

"We have no way of showing a vivid, tangible model of a system to users. It's hard for users to imagine what the new system is going to do for them until it's actually in operation, by which time it's too late."

"By definition, and in any disguise, problem solving is a heuristic process — a process of trial and error. Anyone who fails to recognize this is doomed from the outset, either to outright failure or, at the very least, extreme frustration."

"Many of the most significant problems with systems work are related to simple, fundamental and early misunderstandings about what should happen and who is responsible for making those things happen. I suspect that most important bad decisions are made early. Surely improving the early communication will likely increase the chances for success of the entire project."

"In fact, the user is rarely capable of expressing his desires clearly, and the analyst must be capable of helping the user express his needs . . . The analyst must concentrate on the output of the systems process."

The first two quotes were taken from *Structured Systems Analysis: Tools and Techniques* (1977), written by Chris Gane and Trish Sarson, and the remaining three were taken from *Structured System Development* (1977) by Kenneth T. Orr. What is apparent from these statements is that the problem of communicating with users and specifying systems requirements accurately has been realized for some time, and most methodologies have been attempting to solve it. But, in fact, these problems remain the major stumbling blocks in the systems development process.

> ”
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> *Anyone who has ever been in the software vendor business knows what a traumatic experience it is to release a product.*

The traditional systems development cycle generally consists of several stops. These include:

- A feasibility study, where the technical, operational and cost feasibility of a proposed system is determined.
- A requirements definition phase, where the requirements that the system must meet are determined, documented and approved (the sign-off).
- A design phase, where a physical solution to the requirements is determined. This phase usually proceeds from a general design to an exact specification for the construction of each system component.
- An implementation phase, where the system is constructed, tested and verified.
- A conversion phase, where a smooth transition from the current mode of operation to the new system is made.
- A production phase, where the new system becomes the day-to-day operational system of the user group.
- A maintenance phase, where the system is continually enhanced and revised to meet the ever-changing needs of the users.

Some limitations

Many systems that adequately satisfy user requirements have been designed and implemented using this traditional approach. However, more often than not, problems arise. As mentioned earlier, it's often very difficult for users to pre-specify their total requirements completely.

Analysts document every detail as they understand it, using the latest systems development methodology (which they've learned by either studying a 400-page text on the subject or perhaps even attending a three-day workshop), produce a voluminous requirements specification document and then expect the user to read it, digest it and approve it.

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Because of its sheer size and complexity, the document may simply be avoided by the user or, if he does make an attempt to study it, chances are he will not fully understand it. At some point, out of frustration or desperation, he signs off, and analyst and user move into the next phase of the systems development cycle.

Other problems are the time lags between the initial contact with the user and the production of the requirements document — and between the approval of the specification document and the delivery of the system. During these time lags the following often happens:

■ Users forget details of preliminary discussions or lose interest and enthusiasm for the project.

■ Business conditions may have changed, which can have the effect of making original needs obsolete.

■ Original users who requested the system may have left the company or been assigned to other responsibilities.

The final result is that the delivered system fails to satisfy the requirements of the user.

Several benefits

If, at this stage of the project, some of the effort normally put into producing the requirements definition is expended in building a model or prototype, several benefits can be realized:

■ The user gets immediate feedback from the analyst while his interest and enthusiasm in the project is still high. He sees tangible proof of progress.

■ A conversation piece is created that will stimulate a meaningful dialog between analyst and user.

■ The user can see, touch and work with the system rather than just read about it. He becomes actively involved in the development process and his enthusiasm increases.

■ Project communication is enhanced, and ambiguities are resolved early in the project — before it is too late.

Types of prototypes

The amount of effort expended in the prototyping phase can vary, based on the kind of prototype that is built.

In its simplest form, a prototype can be nothing more than a mock-up of system outputs. Sample reports and panel layouts are developed, and hard-copy representations are reviewed with the user. These will eventually become part of the detailed system specification. For this, almost any interactive programming tool that allows an analyst to design mock-ups interactively and then produce hard copies can be used.

A somewhat more elaborate form of prototype is a throwaway functional model of the proposed system. This type simulates the functionality of the proposed system. Users can actually sit at a terminal and use the system as it would be used in its final form. Data entry, inquiry requests and traversal through program and panel hierarchies can be experienced. In addition, user-friendliness and man-machine dialogs can be evaluated.

A limitation of this prototyping method is that, as much as it looks like the ultimate system, it is still purely a model not capable of evolving into the final, operational system. However, it is excellent for demonstrating the system and selling it to management. And the prototype can serve as a useful requirements tool to communicate the system specifications to the applications developers, but it eventually must be discarded. The final, operational system would have to be redeveloped in the software chosen to implement the system.

For a throwaway functional model, any interactive software tool capable of simulating a real system is adequate, as long as it can produce a model fairly quickly. Personal computer products are often used to produce these prototypes.

The third prototyping method, called an evolutionary system, has all the attributes of the throwaway type with the additional capability of evolving into the final system. This type has been made possible by current fourth-generation software tools.

Fourth-generation tools

Several software tools are needed to produce effectively a prototype capable of evolving into a finished product application. If the proper tools are not selected, the prototyping phase will be seriously hampered. The following is a list of basic tools required for efficient fourth-generation prototyping:

■ An active, integrated data dictionary capable of housing information about all system entities, for example, programs, panels, reports, data elements and so forth. This dictionary becomes a single repository to document and control all system components.

■ An on-line screen-painting facility that is easy to use and capable of producing screens quickly that not only look like the desired panel but that can simulate the functions expected of the system.

■ A nonprocedural report generator that allows prototypers to specify report layouts quickly and produce hard-copy mock-ups of proposed reports.

■ A high-level, fourth-generation language that supports structured programming techniques, reduces or eliminates the complexities of coding and permits programs to be written and maintained quickly and interactively.

■ A query language capable of generating quick, ad hoc inquiries, also integrated with the data dictionary.

■ An automated documentation mechanism that automatically stores and maintains documentation as it is

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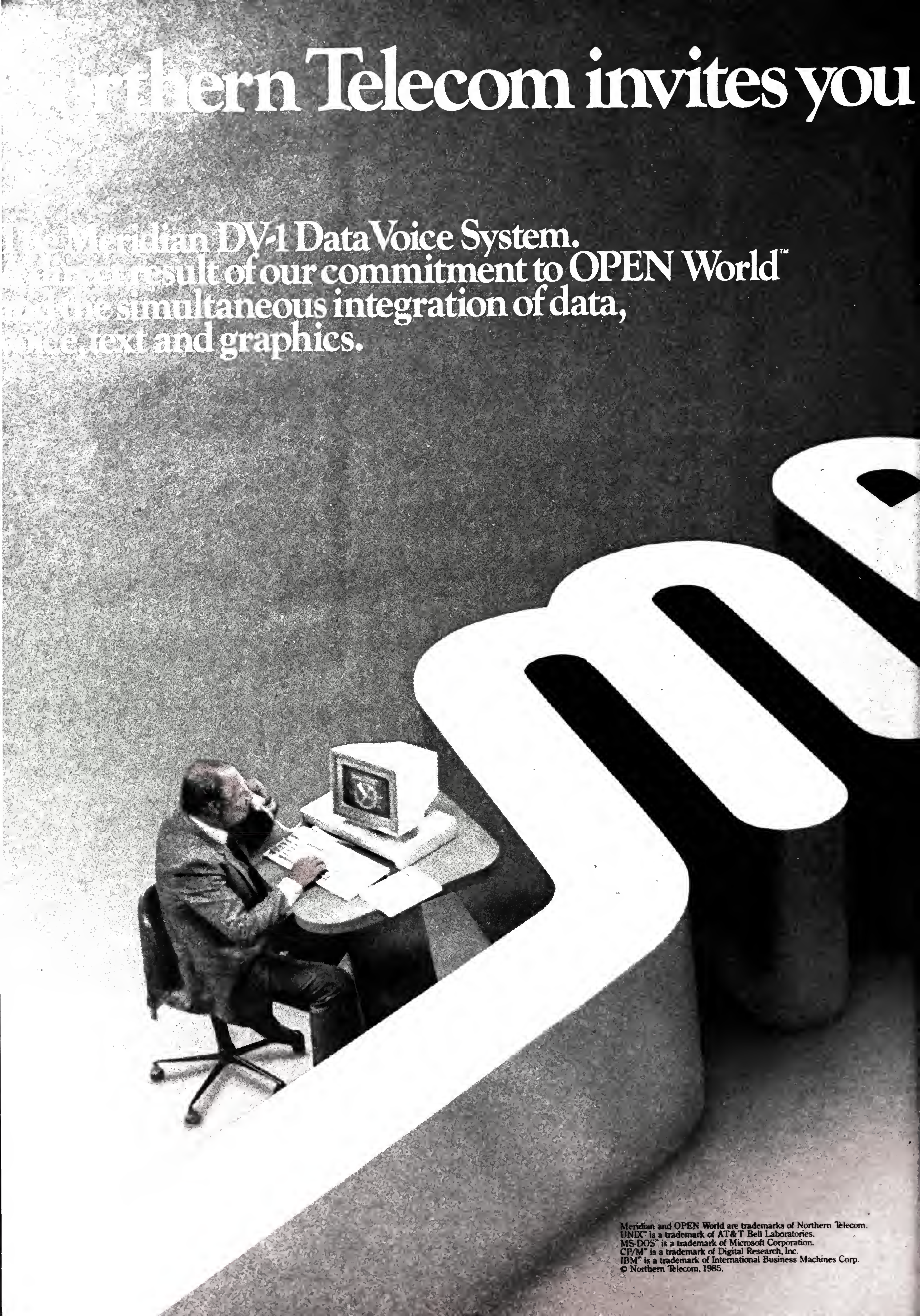
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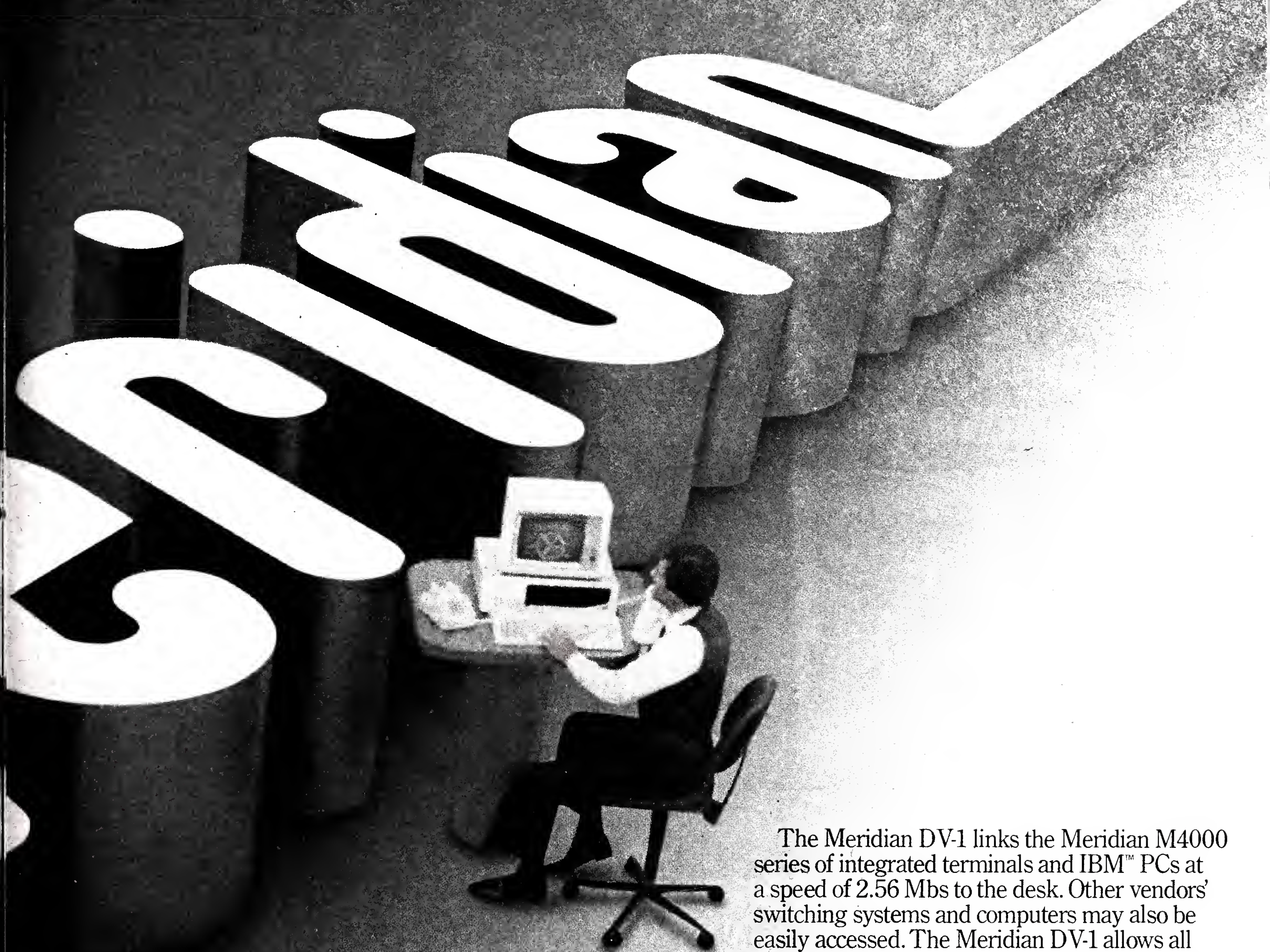

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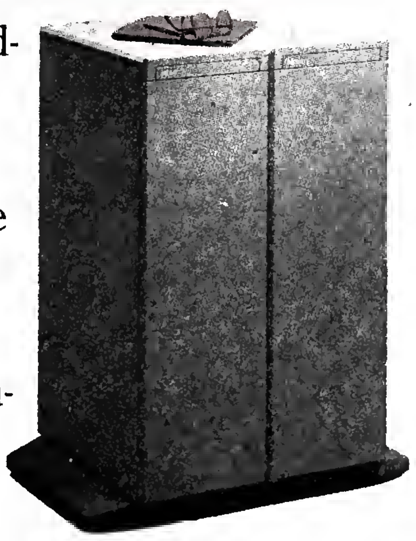

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developed during the prototyping process, with the capability to generate hard copy easily and as needed.

- A data base management system capable of modeling all required file and data structures. The DBMS should support data modeling, facilitate data access to applications and provide physical data structure independence.

In general, good prototyping software should be integrated, available from one workstation, easy to use, menu-driven and command-driven, accessible to and usable by end users, self-documenting, portable and usable in the final, operational system. It should also permit quick modification and reassembly and support multiple versions of system entities.

Guidelines for use

Not all systems are good candidates for prototyping. Batch systems, systems that are highly algorithmic and have few data elements and nonpredictive systems are generally poor candidates for prototyping.

Systems that are highly interactive with significant man-machine dialog, that employ a high degree of data manipulation and record management and that are predictive in nature are generally good candidates. The typical management information system usually works fine.

User participation is another key ingredient and cannot be underestimated. Active contribution on the user's part is mandatory for the success of the project. A prototype that is constructed behind closed doors, regardless of how clever the prototypers are, is no better than a requirements document that fails to communicate the user's needs. The user is the primary catalyst to the success of the prototype.

The prototyping process can be broken down into six basic steps:

1. Initial user confrontation. The process begins with the initial user contact, where a general understanding of system requirements is determined. Basic outputs, existing problems and so on are reviewed.

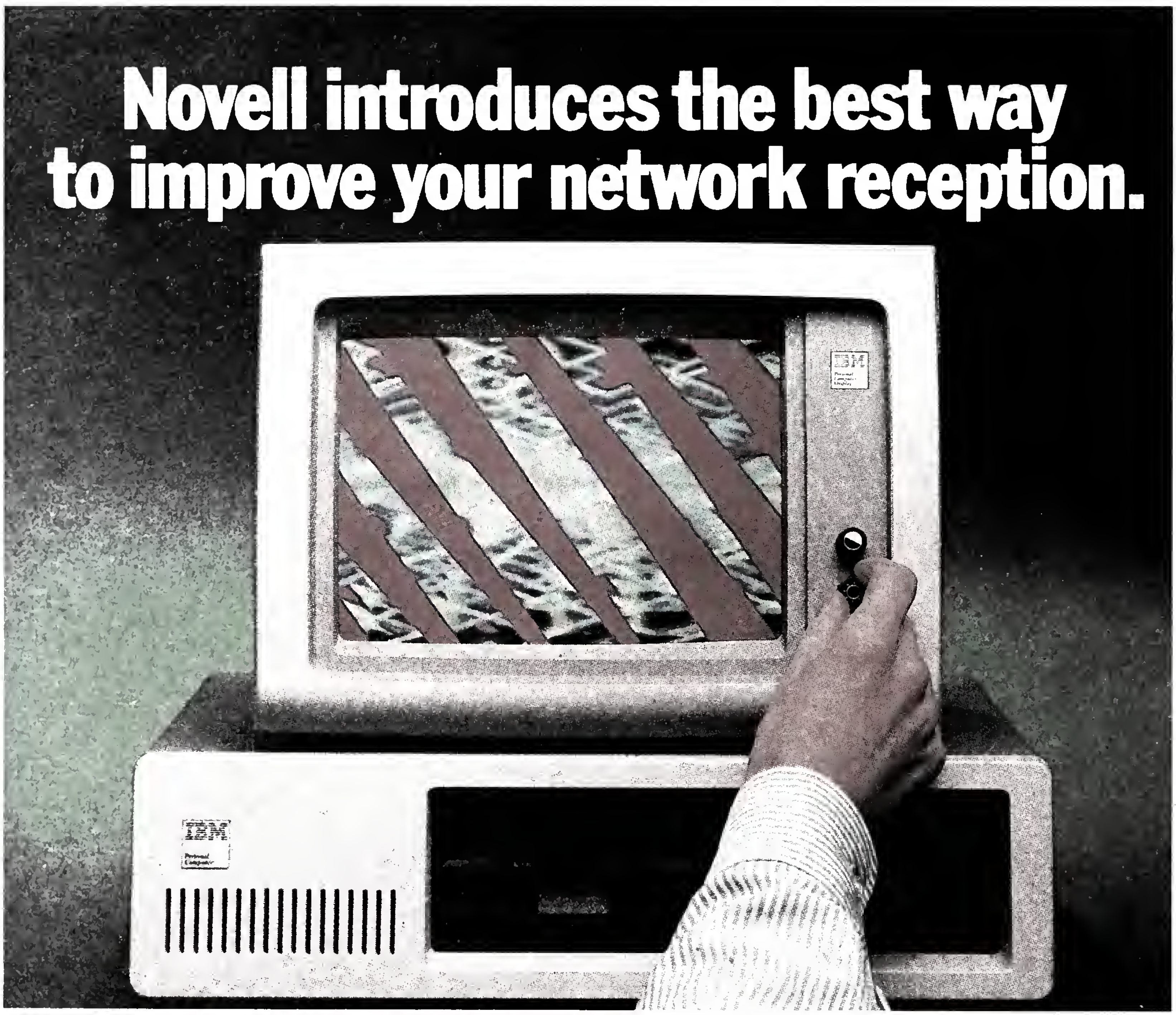
2. First-cut outputs. The analyst immediately documents his understanding of the requirements of the system by building models primarily of the outputs of the system. Sample report and screen layouts are built using the appropriate prototyping tools. Remember, this is all based on the initial user-analyst meeting.

3. User review. The sample outputs are reviewed with the user. A refining process begins. Omissions are pointed out. Misunderstandings are cleared up. Outputs may be consolidated, or the need for additional system outputs may become obvious.

4. Prototype modification. Changes suggested by the user in Step 3 are implemented by the analyst. The analyst himself makes modifications and reviews them with the user. Often, Steps 3 and 4 are combined and executed by the user and analyst. These two steps may be repeated several times, until a mutually acceptable agreement between analyst and user is reached. At this stage of the project, thrashing can occur. The analyst must prevent this from happening by establishing a defined scope with reasonable time constraints. Without this necessary restriction, the refinement process could go on forever. At some point, the process must stop, and the decision must be made to go ahead.

5. Data structure evolution. During the process of defining outputs, the data needed to support the operation becomes evident. This is the signal to start building data structures. Initially, one large flat file will suffice. The objective at this point is to have the data necessary to provide the outputs desired. The source of the data and normalization will occur later. Physical, test data bases can be built at this time, but they are not necessary. Data can simply be defined internally in programs to simulate real data bases.

6. Code program shells. Programming can begin, but in a very high-level fashion. A simple driver program to simulate screen traversal is a good starting point. High-level programs shells that contain narrative documentation or pseudocode and stubs, rather than actual code, could be developed. Many fourth-generation languages closely resemble pseudocode and can be converted quite easily to actual code when used in the implementation of the final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operational system.

Once the prototype is complete and the analyst and user have come to a reasonable agreement regarding system requirements, the more traditional activities of the systems development cycle, that is, those not resolved by the prototype, are undertaken.

What to do now

The prototyping phase was only concerned with system functionality and with the I/O of the system. The less visible aspects of the system must now be dealt with and documented. Hardware and software used to implement the system must be decided upon. Detailed capacity planning and system sizing must be performed. Transaction rates must be determined. Frequencies and volumes must be specified and performance considerations, such as a reasonable response time, must be agreed upon.

Other concerns not addressed by the prototype include security procedures, backup/recovery, conversion, system testing and implementation plans, user sites, system reliability, audit trails and controls and documentation and training.

In the data base area, the DBMS must be chosen. Data must be normalized, logical views completed and data items finalized. Source of input to the data base and procedures for populating the data bases must be determined. In the area of programming, standards must be established regarding module sizes, procedure labeling, Help facility, messages, PF key usage, panel and report layout consistency and so on.

Programs developed in the prototyping process that will be used in the final system must be cleaned up and have rigid, structured programming techniques and guidelines applied to them.

What happens to the prototype is another question that comes up at this time. If it is the type that is not capable of evolving into the final system, it can simply serve as the model or requirements tool for the actual development of the real system. If programs were already written, they can simply be rewritten in the language chosen for implementation. Again, it is much easier to take an existing program and reprogram it than to start from scratch.

The prototyping process is often very enlightening. After the process is complete, it may be decided to discard the prototype and abandon the project or to cease system development and purchase a vendor-supplied solution. The prototyping process may simply have uncovered the fact that the proposed system is really not feasible or at least not cost-justifiable at this time. In these instances, it is better to realize this now rather than after the system is implemented.

Finally, if the prototype was developed with a tool capable of evolving into the final system, its future must be decided upon at this time. If it still meets the requirements of the system after the operational and performance constraints have been applied, it should become the final operational system. If not, it should be examined to determine what can be salvaged or refined to be used in the final operational system.

Often, only a small portion of the prototype system must be redone using an alternate implementation tool to make the prototype a usable system. The screens and many programs may be used as they are.

A little more should be said about choosing the proper tools to implement the system. There is no such thing as the perfect tool. Each has advantages and disadvantages. However, some are more appropriate than others. The best systems are those that are implemented using the appropriate tools.

Today there are more varieties of software than candy in a candy shop. It is not unusual to see an application written in several languages. The main driver programs may be in a fourth-generation language, while subroutines are written in PL/I, Cobol or assembler.

During the era of second and third-generation software, shops were categorized as assembler shops, RPG shops, Cobol shops and so on. This is not the case anymore.

The problem today is that people are attempting to carry this second and third-generation mentality into the fourth generation. Often, the decision to use a specific tool for an entire application is made when some portions would be more appropriate for an alternative software language or tool. People are using tools for the wrong purpose. A fourth-generation language — chosen to realize productivity gains in the applications development phase — is then expected to outperform traditional languages. This is impossible.

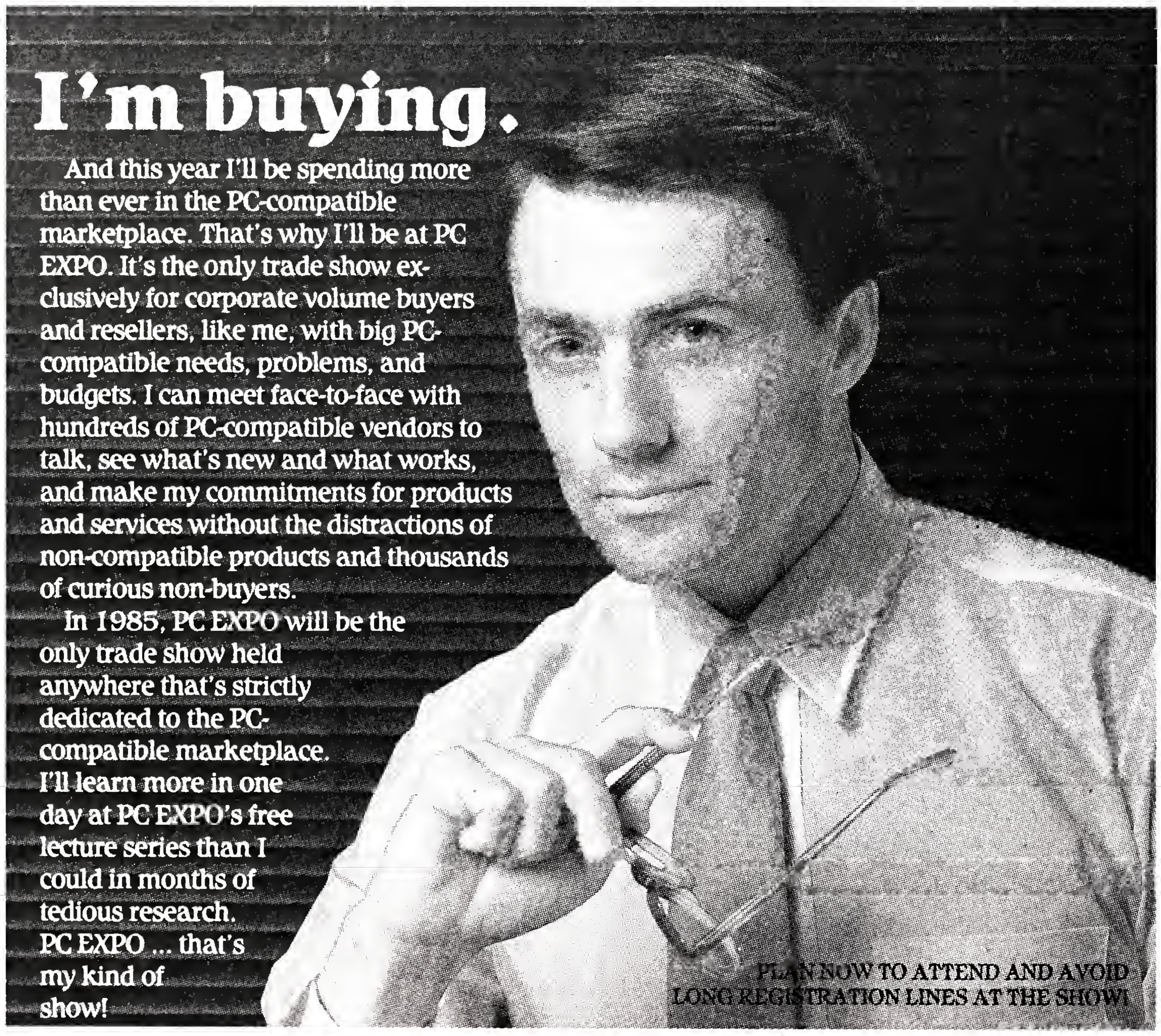
The days of RPG, Cobol and assembler shops are over. The computer professional of today must be knowledgeable in several software tools and languages — and, more importantly, must choose the appropriate tool to solve today's problems.

Prototyping, like any other software development aid or tool, has advantages and disadvantages. It can be used or abused. It is simply another tool to be used in the systems development cycle.

Prototyping is not an excuse to abandon traditional techniques and methodologies that work. It is not appropriate in all situations. If used properly, however, it can be a most effective aid in developing systems that truly meet the needs of users.

About the author

Lee Adamski is manager, Ideal Consulting and Education, at Applied Data Research, Inc. (ADR) of Princeton, N.J. Prior to joining ADR, Adamski worked for Sperry Corp. as a systems education consultant.



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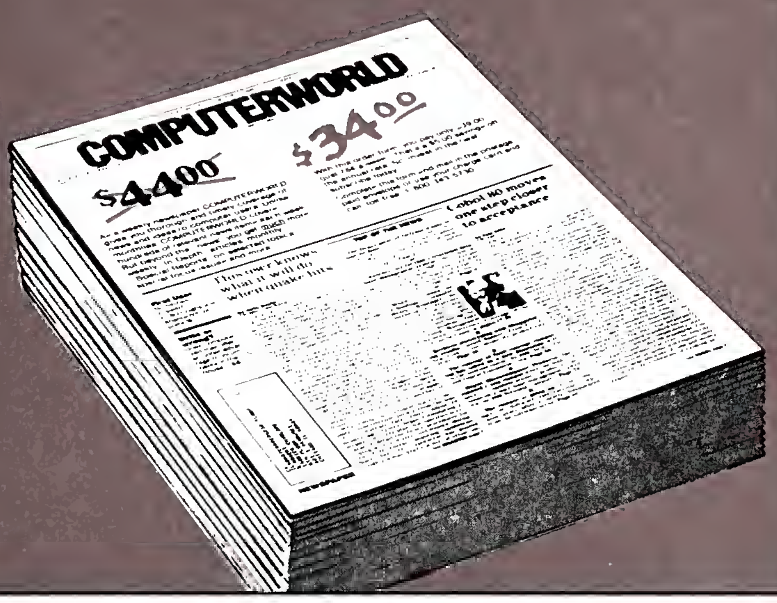

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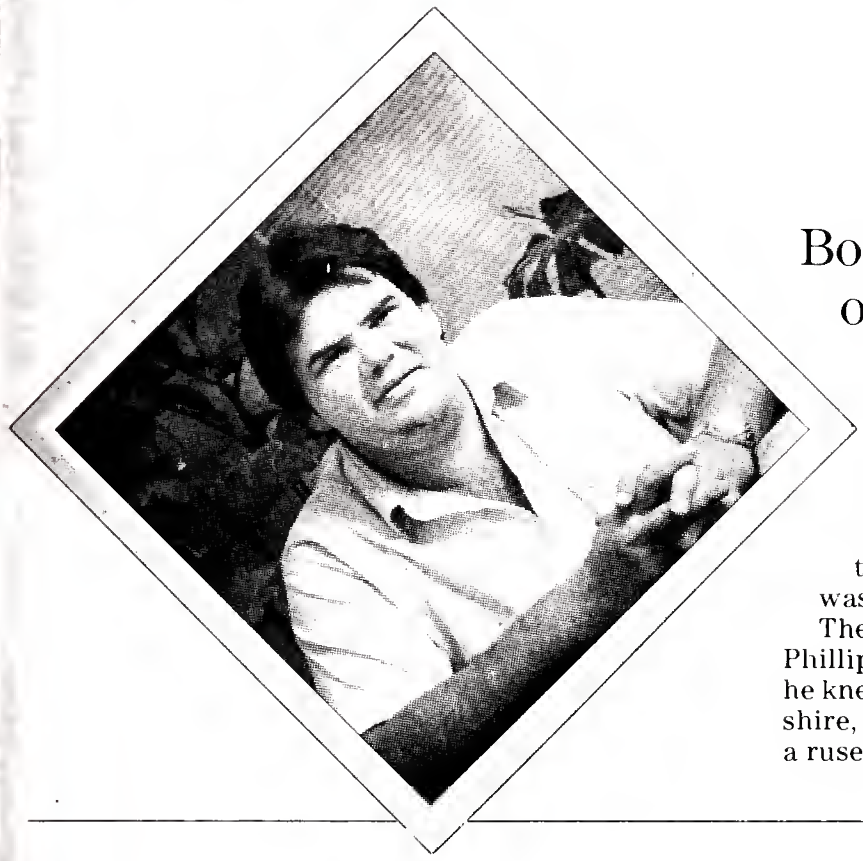


Phillipe Kahn

Borland boss takes unconventional route on the road to micro software success

By Kathleen Sullivan
CW West Coast Bureau

SCOTTS VALLEY, Calif. — Two years ago, in a small office over a garage, Borland International was planning a media campaign to launch its first product, a Pascal compiler called Turbo Pascal. But the fledgling firm was operating under severe financial constraints. It was broke.

The company's founder, a former math instructor from France named Phillipe Kahn, wanted to run an advertisement in a particular magazine. But he knew that the magazine, a small systems publication based in New Hampshire, would expect $9,000 up front. The situation, Kahn decided, called for a ruse.

See **KAHN** page 52

- Tandy unwraps a local-area network for IBM Personal Computers, Tandy micros and other MS-DOS machines/**54**
- Lotus unveils a report writer for its 1-2-3 package/**57**
- Datacopy announces packages that enhance its Word Image Processing System/**59**
- Morrow introduces a battery-powered IBM-compatible portable with a 25-line screen/**60**

Users applaud Reflex tools

By Paul Korzeniowski
CW Staff

Early users of Analytica Corp.'s Reflex, a data base management package that runs on the IBM Personal Computer, said the package provides financial analysis functions that competing software cannot.

"There was no data base management package that met my requirements," noted David Malmberg, director of new technology at McKesson, Inc. of San Francisco. "Most data bases merely store data and do not allow one to analyze it. With those packages, I was unable to build a data base that worked as a financial model. Reflex allows one to group data in various ways and then produce a series of charts or graphs that can be used for analysis."

Announced last November, the data base includes spreadsheet and graphics capabilities that allow users to perform

See **REFLEX** page 55

Zenith boosts microcomputer line

GLENVIEW, Ill. — In a move that other vendors often spread over several years, Zenith Data Systems Corp. this week will announce five personal computers, each running Microsoft Corp.'s MS-DOS operating system and targeting a different segment of the personal computer market.

Two machines, the 14.5-lb Z-171 and the 24-lb Z-138, will be targeted at the transportable market. For entry-level buyers, Zenith will unveil the Z-148, a 128K-byte machine priced at $2,199 with dual-diskette drives. For those who want a more powerful system, an enhanced version of its Z-150, sporting an 8-MHz clock speed (nearly twice that of its older brother), will debut. And for the uppermost strata of the personal computer market, Zenith will introduce its Z-200, said to be compatible with the IBM Personal Computer AT [CW, April 29].

With its LCD screen, flip-down keyboard and twin, vertical diskette drives,

See **ZENITH** page 54

SMALL TALK
Eric Bender
CW Senior Editor

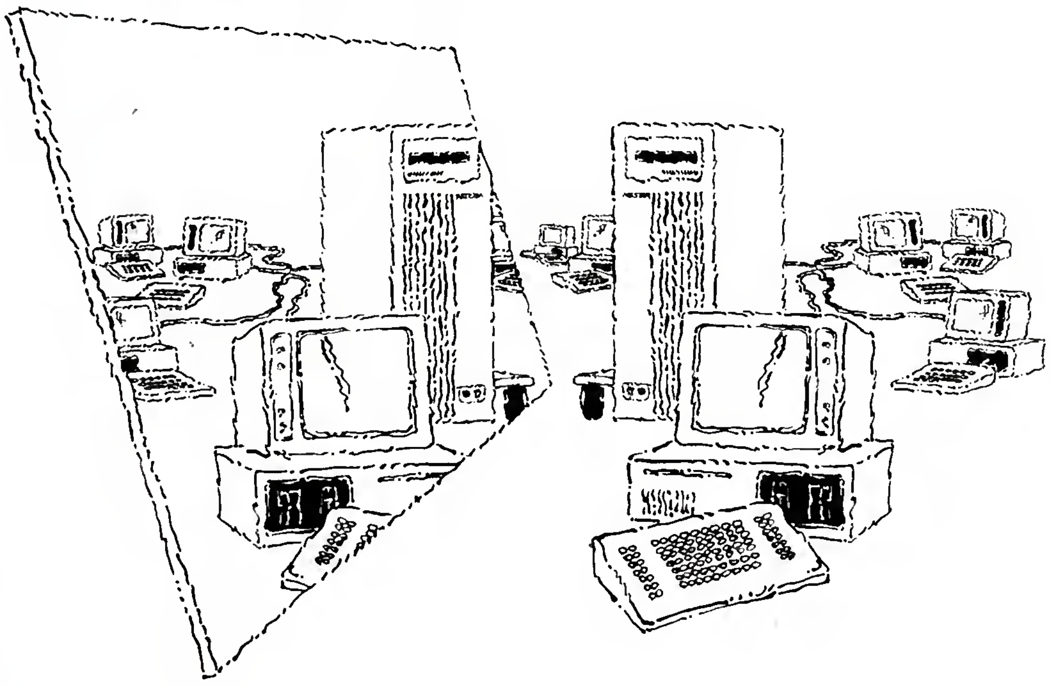
Memory scheme set as showstopper

The first public demonstration of the expanded memory scheme cooked up by Lotus Development Corp. and Intel Corp. begins today on the show floor at Comdex/Spring in Atlanta.

The architecture gives suitably outfitted IBM Personal Computers running under PC-DOS more than 640K bytes of directly addressable random-access memory (RAM) — up to 4M bytes of additional RAM for standard Personal Computers, up to 8M bytes for the Personal Computer AT — with only about 2% performance degradation, claimed Mitchell Kapor, Lotus chairman.

Published as the Lotus/Intel Expanded Memory Specification, the approach is

See **MEMORY** page 55



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Borland continues to expand wares

Since it first appeared on the market, Borland International's Turbo Pascal — a high-speed compiler and language development environment for Zilog, Inc.'s Z80- and Intel Corp.'s 8086- and 8088-based microcomputers — has been joined by four other Turbo programs.

The Turbo family now includes Turbo 87, a Turbo Pascal program with Intel's 8087 support for 16-bit computers; Turbo Tutor, a tutorial for novice Pascal users; Turbo Toolbox, a Pascal program development tool that complements Turbo Pascal; and Turbo Graphix Toolbox, which provides graphics procedures to be used with Turbo Pascal.

Last summer, Borland introduced Sidekick, its first application program, priced at $49.95. Designed for the IBM Personal Computer and compatibles, Sidekick is a desk-accessory program that includes a notepad, a calculator, an appointment calendar, an automatic telephone dialer and Ascii conversion tables.

In February, the firm began shipping Superkey, a keyboard enhancement program priced at $69.95. With Superkey, users can program a single key to replace often-used commands.

What's next for Borland? The firm is now working on Sidekick Plus, a successor to Sidekick, according to Phillipe Kahn, Borland's founder. In addition, the company is developing language tools for C, Modula-2 and Basic, he said.

Seeking to dispel rumors, Kahn added the firm is not designing a Lotus Development Corp. 1-2-3 look-alike or an Ashton-Tate Dbase II clone.

KAHN

from page 51

So Kahn designed a phony flip chart that listed the top business and computing magazines of the day, with notes on how large an ad the firm planned to take out in each. "*Business Week* — double spread," read one page. While the target magazine was included on the chart, it had been crossed out.

Kahn enlisted a friend to play his secretary, and instructed her to interrupt his meeting with the target magazine's salesman with the message that a large Japanese firm wanted to order one million copies of Turbo Pascal.

When the salesman arrived, he noticed the chart and asked Kahn why his magazine had been crossed off it. Kahn feigned embarrassment and apologized, saying his staff should not have left the chart out. When his "secretary" told him that a Japanese firm was on the line, he left to take the call in an adjoining room. There, watching through a peephole drilled for the occasion, Kahn saw the salesman staring with bewilderment at the chart.

When Kahn returned, the salesman had been snared. He volunteered to give the Turbo Pascal advertisement special placement at a reduced rate and, most importantly, gave the firm two months to pay. Kahn, pretending to be reluctant, agreed.

Turbo Pascal, sold through mail order, went on to achieve remarkable success, analysts said. Jan Lewis, a senior analyst with Infocorp, a Cupertino, Calif.-based market research firm, said the release of Turbo Pascal resulted in a ground swell of grass-roots support for the young firm.

According to Kahn, more than 300,000 copies of the $49.95 program have been sold since late 1983. Turbo Pascal gave Borland a solid financial footing for marketing other products (see story left).

Kim Evans, an industry analyst at Dataquest, Inc., a San Jose, Calif.-based market research firm, estimated that privately owned Borland took in $10 million in revenue in 1984.

The original Turbo Pascal ad, now framed, hangs in the firm's conference room. Borland's ads, which are long on information and short on style, have become a trademark of sorts for the firm. "Their ads might not be elegant, but they are effective," Lewis said.

Although his days of hoodwinking unsuspecting salesmen have passed, Kahn continues to champion an unconventional approach to business, which extends to his style of dress. At a recent interview, Kahn sported bright red corduroy slacks and a flowered Hawiian shirt.

When asked to describe the firm's philosophy, Kahn, who worked his way through college playing the saxophone in French jazz clubs, paraphrased American jazz musician John Coltrane. "Coltrane once said, 'Damn the rules. Any way you play it, it's the same 12 notes,' " Kahn said.

Champion of functionality

Unlike other firms that emphasize the importance of marketing, Borland champions functionality. "We sell useful software at rock-bottom prices," Kahn said. "We are customer-oriented first. We are product-oriented and technology-driven. Marketing comes after that."

At a time when experts said there was no market for programming tools, Kahn built a prosperous firm on the shoulders of a Pascal compiler, said Scott Tiernan, who sits on the board of the Software Entrepreneurs' Forum, a Palo Alto, Calif., group. "He has shaken up an industry that really was closed to the little developer," Tiernan said.

Tiernan added that independent software developers regard Kahn as a hero. "Everyone likes to see someone who becomes successful, especially when they're going aginst the grain," he said.

Dataquest's Evans attributed Borland's accomplishments to the company's ability to provide "excellent technically oriented products" to a specially targeted audience — the technical, scientific and student markets. "It's a significant part of the market whose needs have not been addressed to the fullest extent," she said.

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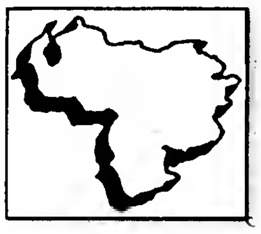

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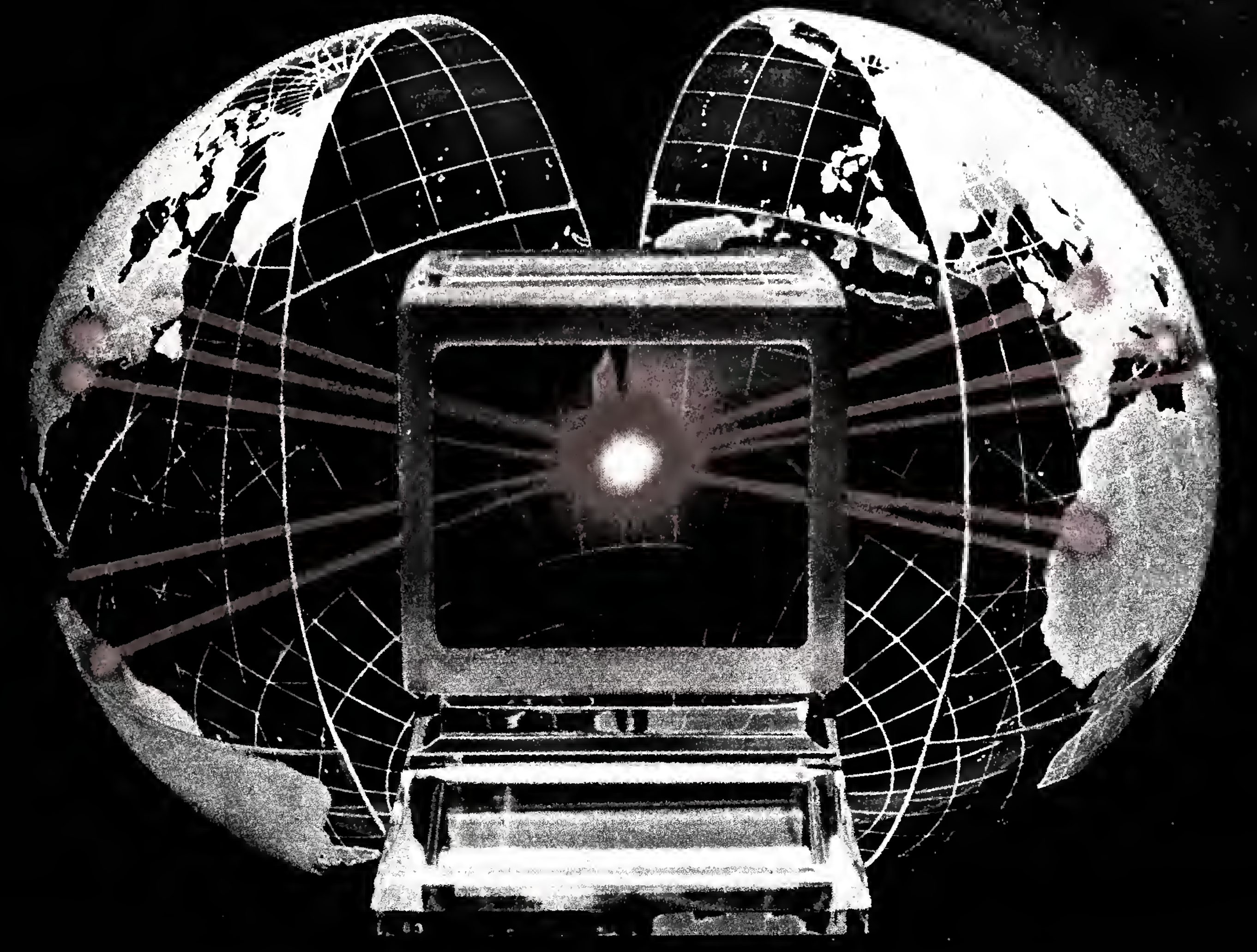

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INFOTRON SYSTEMS

HP launches hardware, software for micro OA

By Jeffry Beeler
CW West Coast Bureau

PALO ALTO, Calif. — Hewlett-Packard Co. late last month moved on both hardware and software fronts to make its personal computer line more useful in office automation.

On the hardware side, the firm extended its Touchscreen microcomputer family with the introduction of two desktop processors that provide larger display screens and more I/O capacity than their HP predecessors.

On the software side, six additional modules were added that reportedly reflect HP's desire to encourage use of the Touchscreen machines as stand-alone micros rather than as terminals. The six packages follow:

- HP Access, a Touchscreen-resident application that reportedly simplifies the task of extracting data from host CPUs or micros and allows users to download the material for local processing.
- HP Application Link, an Access-like product that extends the company's existing financial applications by permitting accounting data to be retrieved remotely from HP 3000s and downloaded to Touchscreen sys-

See **HP** page 60

Tandy introduces micro net

FORT WORTH, Texas — Tandy Corp. has announced a personal computer local-area network that requires no dedicated file server.

The Vianet network reportedly will link IBM and Tandy personal computers and other machines' computers running Microsoft Corp.'s MS-DOS operating system. Each micro will gain equal access to the network's resources. Vianet will be based on the Datapoint Corp. Arcnet token-passing data-link hardware.

Vianet reportedly needs no central, dedicated computer to function as a server and has a fully distributed architecture and simple command structure. If one personal computer in the network fails, the network will remain up, Tandy said.

Vianet users reportedly will be able to share applications software and any data or printers normally accessed by that software. The Tandy network also emulates Microsoft MS-DOS 3.1 record-locking calls, allowing multiuser applications to run without modifications.

Vianet interface boards — with network software — for Tandy Models 1000, 1200, 2000 and other IBM Personal Computer compatibles cost $499.95. An active hub for the network costs $695.95. A passive hub costs $69.95.

Tandy is located at 1800 One Tandy Center, Fort Worth, Texas 76102.

ZENITH

from page 51

the Z-171 may be the most eye-catching machine of the group. The resemblance of the $2,699 Z-171 to Morrow, Inc.'s Pivot is no accident, according to Zenith Marketing Vice-President John Frank.

The Z-171, Frank said, is the result of a joint venture with Morrow in which Zenith enhanced the Pivot's basic design to include a back-lit, 25-line display, a pressure-sensitive function key template and optional support for a VDT. The machine will ship in June and is based on the Harris Corp. 80C88, a Cmos chip with reduced power requirements.

The other transportable in the rollout, the Z-138, is "25% lighter than most CRT-based [transportables] on the market," Frank said. Based on the Intel 8088 chip, the standard Z-138 includes a 7-in. Zenith Chromagold amber display; detached keyboard; 128K bytes of memory (expandable to 640K bytes); one 360-byte, 5¼-in. diskette drive; and MS-DOS 2.11 and 1.25. It costs $2,299. A dual-drive, 256K-byte unit costs $2,599. Both will ship in July.

For the low end of the desktop market, the Z-148 reportedly offers in its standard version one 360K-byte diskette drive, 128K bytes of memory, serial and parallel ports, detached keyboard and MS-DOS. It costs $1,899. A dual-drive unit costs $2,199. Both will ship in July.

The enhanced Z-150, called the Z-158 series, reportedly is based on the Intel 8088 processor but operates at a clock speed of 8 MHz instead of the 8088's standard 4.77 MHz. As a result, applications execute 60% faster, Zenith said. For timing-sensitive Personal Computer software, a switch reduces the clock speed to 4.77 MHz. Machines in the Z-158 series will include a single-drive model, priced at $2,499; a dual-drive model, priced at $2,899; and a dual-drive model with an internal 10M-byte disk, priced at $4,099. Delivery of Z-158 series machines will begin in July.

Zenith also is introducing a line of monochrome monitors that use what Zenith called nonglare technology to reduce reflections. A 12-in. model, with either an amber or green screen, will cost $199. An amber screen, 12-in. monitor with what Zenith called an improved contrast element will round out the line. It costs $229.

Zenith Data Systems, a subsidiary of Zenith Electronics Corp., is located at 1000 Milwaukee Ave., Glenview, Ill. 60025.

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REFLEX from page 51

"what-if" functions with their data. "We have to analyze data in different ways so we know where and when to sell different products," noted Robert Dafala, assistant vice-president at Crocker National Bank in San Francisco. "Reflex stores historical performance and sales data and provides the tools needed to analyze it."

Reflex had to supply a number of mathematical functions to analyze the data. "A number of data base packages allow a user to include simple equations in a report or a data base," said James Washagan, sales administration manager at Clorox Co., an Oakland, Calif., manufacturer of household products. "Reflex provides sophisticated statistical features such as the ability to add or multiply columns."

Malmberg, a beta test user of the package, has worked with Reflex since November, monitoring the performance of various McKesson subsidiaries, such as its liquor distributor with 40 facilities.

"We have a number of suppliers for various brands of liquor," he explained. "Reflex allows us to monitor the financial performance of each supplier. With the package one can examine a physical record, translate the data into a graph and produce a number of charts."

At Clorox, Reflex supplements Information Builders, Inc.'s Focus. Washagan downloads Ascii files from Focus and loads them into Reflex to produce graphs and reports that help monitor sales performance.

Before finding Reflex, Washagan had searched through a number of other data base packages for one that met his needs. These packages included Information Builders's PC/Focus, Microrim, Inc.'s R:Base 4000 and Micro Data Base Systems, Inc.'s Knowledgeman.

For Malmberg, Lotus Development Corp.'s 1-2-3 was inadequately fulfilling functions that are now completed with Reflex. "After one builds a Lotus model, he can just examine how various input would affect output," he said. "Reflex allows one to build different types of models and look at data in different ways."

The beta users claimed that Reflex was easy to operate. "The package's pull-down menus and Help screens alleviate training woes," Washagan said. "The package is much easier to work with than something like [Lotus'] Symphony, which has five or six layers." Users said they were operating the product a few hours after receiving it and were constructing complex data base models in a few days.

Complaints about the product were few. Reflex did not supply relational capabilities, Washburn noted, so that users are unable to link files.

A second complaint focused on Reflex's report-writing module. "I am unable to load it and the program disk at the same time," Malmberg said. "They should be stored on the same diskette."

Despite the beta users' praise of the product, six to eight months after first receiving it the users are like Lone Rangers in their corporations. "Although I am the only person at the company working with the product now, I think it may soon be introduced to other departments," Malmberg predicted.

First commercial deliveries of Reflex began in April.

MEMORY from page 51

a variation of memory paging, in which one region of the processor's address space is equipped with an I/O port and performs as a window to the larger paged memory.

In the case of the Lotus/Intel spec, a 64K-byte region called the page frame is mapped out somewhere between 784K bytes and 960K bytes. Within the page frame are four 16K-byte windows — each of which is independently addressable, speeding things up.

Expanded memory paging

The PC-DOS/MS-DOS software driver, called the Expanded Memory Manager, pulls pages of expanded memory into the page frame when they are necessary, according to Intel. The driver also handles programs that run concurrently, as well as print spooling and virtual disk functions.

This, in short, is described by Lotus and Intel as the "expanded memory" approach.

As the spec notes, this approach has nothing to do with what IBM calls "extended memory" for the Personal Computer AT. The AT's 80286 processor potentially can access extended memory in the 1M- to 16M-byte range — but programs running under PC-DOS can't, except as a virtual disk.

Within the MS-DOS world, of course, there are other ways to get that added RAM. Among these is the software segmentation architecture in the Microsoft Corp. Windows environment, which shuffles data around more flexibly, according to Chris Larsen, MS-DOS product manager at Microsoft.

Virtual memory support

Alternatively, the next release of MS-DOS may support virtual memory, a more sophisticated technique than memory paging and one that will bring "personal computer software technology into the 1970s," speculated Richard Strauss, vice-president for products at Corporate Software, Inc.

As usual, IBM's plans remain obscure. Tom Billadeau of TRB & Associates is among those suggesting that Big Blue may go with a virtual machine facility, "which could be cheaper."

While acknowledging that uncertainty, however, Kapor pointed out that "there's nothing else out there now."

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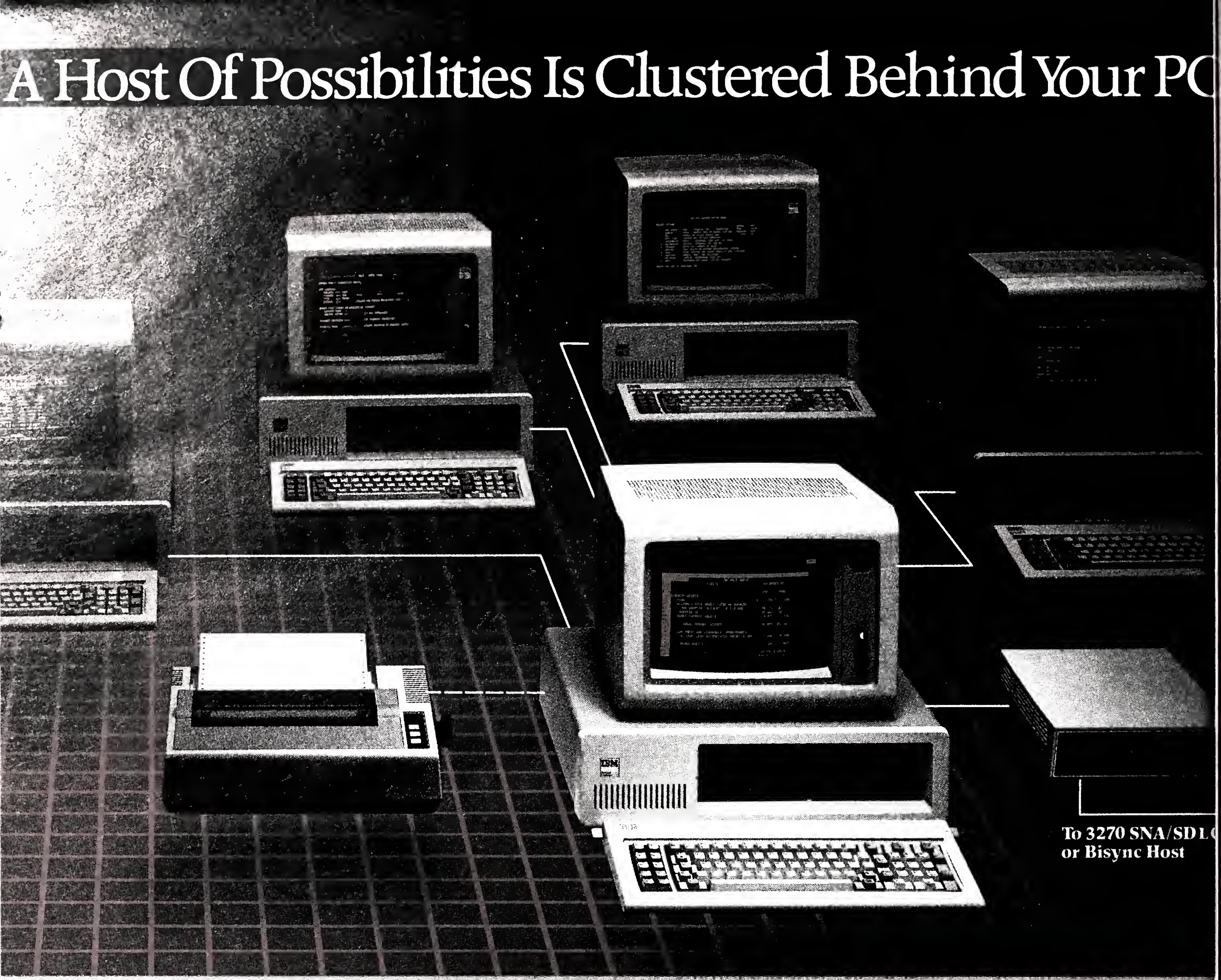

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Lotus unveils report writer for 1-2-3

CAMBRIDGE, Mass. — Lotus Development Corp. last week introduced 1-2-3 Report Writer, a $150 program well described by its title.

The package will enable users of Lotus' 1-2-3 program to create custom reports and forms using data from 1-2-3 data base files.

The Report Writer is said to change or delete fields, to add multiple-line headers or footers, to sort up to four levels and to perform calculations.

Additionally, the product will save report formats and libraries for future use, according to a spokesman. It will store up to 30 different formats per file.

The package will handle up to 150 fields and as many records as a 1-2-3 data base can contain, he said.

Originally developed by Concentric Data Systems, Inc. of Westboro, Mass., and named 3-2-1 Report!, 1-2-3 Report Writer represents the first Lotus product to reach the market that was not developed in-house, the spokesman noted.

The program reportedly will work with existing versions of 1-2-3 and with the release scheduled for fall shipment.

Available this fall, 1-2-3 Report Writer will run on the IBM Personal Computer, Personal Computer XT, Personal Computer AT and the Compaq Computer Corp. line of IBM-compatible systems.

Running with 1-2-3, it requires 256K bytes of internal memory, IBM's PC-DOS or Microsoft Corp.'s MS-DOS 2.0 or higher operating system and a minimum of two floppy disk drives.

The software will be demonstrated for the first time at Comdex/Spring '85 this week in Atlanta, the spokesman said.

Lotus is headquartered at 55 Cambridge Pkwy., Cambridge, Mass. 02142.

AST, Borland to market tool

IRVINE, Calif. — AST Research, Inc. and Borland International have announced a joint marketing agreement under which Borland's Sidekick desktop utility software package will be bundled with AST's Sixpackplus multifunction board for the IBM Personal Computer.

Under the agreement, AST will begin including Sidekick in Sixpackplus this month. A nonprotected copy of Sidekick will be mailed to existing Sixpackplus users, AST said.

Sixpackplus reportedly offers up to 384K bytes of memory and several I/O capabilities.

Sixpackplus with 64K bytes of memory and Sidekick costs $395. Sold separately, Sidekick costs $84.95 in its unprotected version.

AST Research is located at 2121 Alton Ave., Irvine, Calif. 92714.

Commodore high-performance micros out

Unix-compatible C900 based on Zilog CPU

HANNOVER, West Germany — Amid much fanfare here at last month's Hannover Faire, Marshal Smith, Commodore Business Machines, Inc. president, launched that company's latest entry into the high-performance range of microcomputing — the Commodore 900. The product is a 16-bit AT&T Unix-compatible personal computer.

The C900 machine, based on Zilog, Inc.'s Z8000 CPU, will be available in two versions, Models I and II. Model I operates as a single-user personal workstation with an emphasis on computer-aided design applications. The Model I features a graphics resolution of 1,024 by 800 pixels, a mouse control device and windowing capabilities. It comes with a 15-in. monochrome monitor, a video controller card with a 128K-byte memory and a 20M-byte hard disk.

The Model II, the multiuser system, is equippd with C compiler software, more than 50 applications and a Business Basic Compiler. Model II features a monochrome monitor and a 67M-byte hard-disk capacity, and supports up to seven RS-232C ports.

The main storage capacity of both models is 512K bytes of random-access memory, expandable to 2M bytes. The built-in hard disk has between 20M and 67M bytes, and the floppy disk drive has 1.2M bytes.

The C900 runs under the Coherent operating system offered by Mark Williams Co. of Chicago. Coherent is said to be completely compatible with AT&T's Unix System V Version 5.2 and to put its utilities and operating system into 2M bytes of disk storage.

The Commodore 900 machines will be built in Germany and will be available in the U.S. in the third quarter. Prices for the machines will begin at approximately $2,700, Smith said.

Commodore is headquartered at 1200 Wilson Drive, Westchester, Pa. 19380.

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Quadram announces voice/data integration boards for IBM micros

NORCROSS, Ga. — Quadram Corp. has introduced for the IBM Personal Computer and Personal Computer XT its Silver Quadboard enhancement card and its Asher C1200 and C2400 voice/data integration boards.

The Silver Quadboard is said to offer up to 640K bytes of memory based on 256K-bit dynamic random-access memory (RAM) chips. It comes bundled with Quadmaster III software and includes one parallel and one serial port.

The Quadmaster III software reportedly offers users the ability to set up virtual memory disks in RAM, with the virtual disk size fixed in 1K-byte increments. The package also includes a controlled print buffer.

The C1200 and C2400 Asher boards reportedly are full-length cards linked through dual cables to the user's telephone system. Communications commands are controlled by the Personal Computer's keyboard, and voice and data transmission takes place simultaneously.

The C1200 reportedly offers communication at 1.2K bit/sec. and can be upgraded to 2.4K bit/sec. without replacing the entire card. Both cards are equipped with a concurrent windowing program that permits users to run five different programs in main memory.

The C1200 costs $695; the C2400 is $995.

Without memory, the Silver Quadboard is offered with serial, parallel and game ports, clock calendar and software for $325. Memory configurations are priced as follows; 64K bytes, $395; 384K bytes, $595; and 640K bytes, $795. An optional second serial port costs $50. The Silver Quadboard reportedly will be available in the second quarter.

Quadram is located at 4355 International Blvd., Norcross, Ga. 30093.

Service program offered

CULVER CITY, Calif. — Ashton-Tate has announced a Corporate Emphasis program, designed to supply large corporations with technical support and programming tips. Companies purchasing 25 copies of Ashton-Tate products are eligible for the program.

Services include a technical support phone line open only to large corporations, a list of third-party training companies certified by Ashton-Tate and the help of Ashton-Tate engineers in developing various applications.

The program provides self-study training textbooks, workbooks and demonstration diskettes.

Ashton-Tate also announced it will begin publishing three periodicals. "Tech Notes," designed for corporate microcomputer support specialists, will offer tips on applications development, the vendor said. "Corporate Update Newsletter" will supply executives with product information. "Ashton-Tate Quarterly Review" will consist of case studies and other materials from books published by Ashton-Tate's Publishing Group.

In addition, Ashton-Tate plans to form an advisory board of corporate microcomputer managers to inform the company of other support needs.

Ashton-Tate is located at 10150 W. Jefferson Blvd., Culver City, Calif. 90230.

Datacopy adds enhancements to Wips system

MOUNTAIN VIEW, Calif. — Datacopy Corp. has introduced two software packages that enhance its Word Image Processing System (Wips) and one package that provides Wips capabilities without the use of an image scanning device.

The Wips system operates on the IBM Personal Computer XT and AT and consists of a scanning device, which captures an image, and Wips software, which reportedly permits image storage and manipulation.

One of the packages, Wips Editor, permits the editing of a Wips image file at the picture element level, according to the vendor. It allows scrolling in its zoom mode and features such editing tools as paintbrush, airbrush, erase, drawing and text insertion. Cut-and-paste capability is also provided.

Another of the packages, Wips Planner, reportedly permits page planning, including the layout of pages and integration of text and graphics. The layouts are created by defining boxes for text and images or by modifying standard layouts.

The third product, Wips Jr., is said to contain all of the image-handling capabilities of the standard Wips software except image capture capability. Systems under Wips Jr. gain images for manipulation via diskettes or a communications network.

Wips Jr. is priced at $495. Wips Planner costs either $995 or $1,350 depending on features. Wips Editor is priced at $245.

Datacopy is located at 1215 Terra Bella Ave., Mountain View, Calif. 94043.

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Morrow unveils IBM-compatible portable

By **Kathleen Sullivan**
CW West Coast Bureau

SAN LEANDRO, Calif. — Morrow, Inc. this week will introduce the Pivot II, a battery-powered portable the firm said is fully IBM-compatible. The Pivot II features a specially designed LCD with a 25-line screen.

Based on the 16-bit 80C88 Cmos microprocessor, the 13-lb Pivot II portable comes with Microsoft Corp.'s MS-DOS 2.11 operating system. The computer reportedly includes Newword, a word processing program from Newstar Software, Inc.

Included in the system's 32K-byte read-only memory are a personal appointment scheduler, a four-function windowing calculator, a clock calendar, phone directory and automatic dialing program, Morrow said. Unlike other portable computer firms, which have adopted the 3½-in. disk drive for their new systems, Morrow has retained the standard 5¼-in. disk drives for the Pivot II line.

An internal rechargeable battery will power the system for approximately three hours, the company said.

Like its predecessor, the Pivot, the system includes Morrow's Lumicon display technology, which the company said enhances viewing under difficult lighting conditions. The screens reportedly feature a proprietary nonglare material. Three models will be available. One model will feature a single disk drive and 256K bytes of random-access memory (RAM). It will cost $1,995, the firm said.

The other models will come with dual disk drives, an internal 300/1,200 bit/sec. modem and red-green-blue and composite video capabilities as standard features, the company said. One model, with 256K bytes of RAM, will sell for $2,995; and the 640K-byte version, for $3,795.

The firm has promised to deliver an adapter kit by the third quarter of this year that will allow users to hook up the Pivot II to an IBM expansion chassis.

Morrow is located at 600 McCormick, San Leandro, Calif. 94577.

HP

from page 54

tems, according to HP.

- HP Word/150, which for the first time allows a secretarial word processing capability to be offloaded from HP 3000s to the company's micros.
- HP Print Central, which reportedly provides users with a command-free means of borrowing a shared printer by going through a host HP 3000.
- Two programs that reportedly make the company's Thinkjet and Laserjet printers compatible with Apple Computer, Inc.'s Macintosh.

Joining HP's personal computer line are the Touchscreen II and Max II, which satisfy widespread user demand for an enlarged screen, according to John Metcalfe, the firm's OA marketing manager. Both the latest Touchscreen models boast 12-in. screens, compared with 9-in. displays for the product family's original members.

Unlike existing HP micros, which offer only two accessory slots, the Touchscreen II and Max II each come with four slots. Metcalfe said the availability of two extra slots gives users increased flexibility to expand their memories or attach additional peripherals as their needs dictate.

In contrast with earlier HP micros, the two latest machines are said to provide a choice of user interfaces — Touchscreen or conventional.

With HP Access, users of both the Touchscreen II and Max II can remotely retrieve information from an HP 3000 series data base without knowing anything about the host's commands, Metcalfe said. The same software product reportedly can allow the two desktop models to gain access to personal computer data bases.

Moreover, under an agreement with Cullinet Software, Inc., HP plans soon to expand Access' capabilities to enable Touchscreen users to extract and download data from IBM mainframes, Metcalfe said.

Prior to the introductions, users of HP's micros had to remain connected to a host HP 3000 if they wanted to take advantge of the company's secretarial word processing package. With HP Word/150, that word processing capability can reside locally on a Touchscreen processor, which, for the first time, can serve as a stand-alone workstation for secretaries, Metcalfe said.

The Touchscreen II, which comes with two 3½-in. floppy disk drives, costs $3,545, compared with $5,570 for a Max II with one floppy disk and a 20M-byte Winchester disk.

HP Access costs $625 in its Touchscreen version; HP Application Link, $5,000; HP Word/150, $345; HP Print Central, $180; the Thinkjet program, $45; and the Laserjet package, $95.

HP is headquartered at 3000 Hanover St., Palo Alto, Calif. 94304.

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(C) Accessible Tables:	40	10
Password Security:	Yes	No
User-Definable Data Entry Rules:	Yes	No
Automatic Key Index Maintenance:	Yes	No
Data Dictionary:	Yes	No
Number of Relational Operators:	6	2

[1] From original manufacturer.

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COMMUNICATIONS

WIRE TAP/DANIEL MINOLI

Net optimization takes practical insight

Some network design issues from five years ago still confront the practitioner trying to optimize a network in the postdivestiture era to take advantage of tariff gradients for traffic flowing within and between Local Access Transport Areas.

These issues relate to the processes used to calculate the resources needed to connect corporate facilities, which determines such things as the number of lines, ports or pooled modems needed. The desire of network optimization is to minimize the facilities used while achieving a desired grade of service based on response times and the number of busy signals the user is willing to endure.

The pragmatist who routinely consults modeling tables to determine the number of lines needed to support given traffic patterns — such as Erlang B tables — may be overlooking some assumptions made with the model that could obscure actual needs.

The following are some assumptions intrinsic to many modeling aids that diverge from the conditions typical of network environments:

- Many optimization models assume — for mathematical reasons — that the number of users that need to be supported at a remote site is infinite. Presuming that all other assumptions made with network models such as Erlang B are valid, this assumption leads to drastically different results compared to the answers reached when the real population at that site is considered.

A more sophisticated model, the Engset model, uses most of the same assumptions as Erlang B but takes into account real user populations, leading to a more realistic determination of the resources needed. Formulas that use infinite populations can suggest the use of twice as many lines or ports, for example, as models that take into account actual user

See **MODEL** page 73

Minoli is an associate vice-president, systems planning and engineering, of Prudential-Bache Securities, Inc. in New York.

IBM 3274 upgrade coming?

DATA STREAM
John Dix
CW Senior Editor

Although the timing is still uncertain, there are many indications that IBM is readying a replacement for its workhorse communications controller, the 3274, that will offer a slew of improvements over the older box.

While some of the capabilities discussed here are drawn from user wish lists instead of from concrete insight into what the controller will actually look like, most assumptions revolve around the idea of increasing connectivity on both the workstation and host sides of the controller.

Many of the capabilities analysts expect to be incorporated into IBM's 3274 replacement are already available from plug-compatible controller manufacturers. The replacement box will, for example, probably support 64 devices, twice the number supported by the 3274; this is a feature available from a couple of competitors.

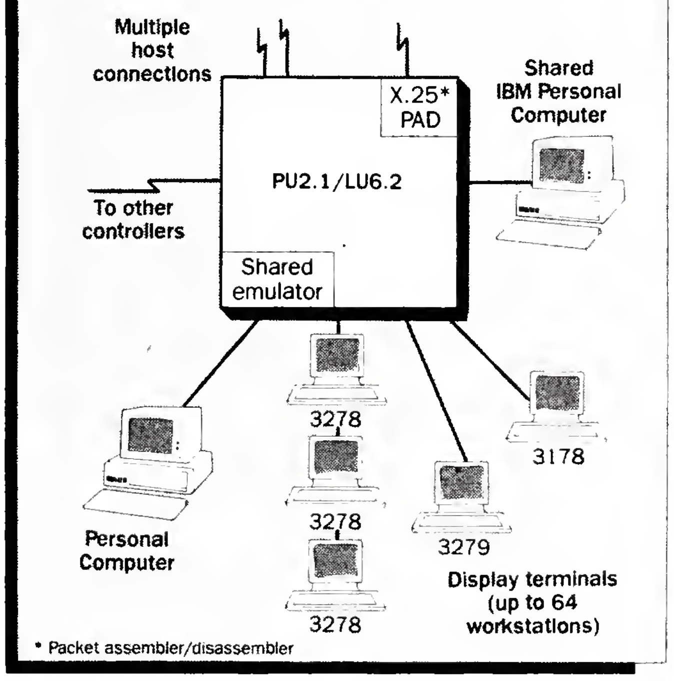
Today, the 3274 within IBM's System Network Architecture (SNA) is a Type 2 Physical Unit (PU). All nodes in SNA networks are associated with one or more of the following: an actual physical unit type, a Logical Unit (LU) or a Systems Services Control Point (SSCP).

Within SNA the 3274 replacement will likely be an upgraded type of Physical Unit known as a PU 2.1. If

See **3274** page 72

CW CHART BY MITCHELL J. HAYES

Possible capabilities of IBM 3274 replacement


Multiple host connections
X.25* PAD
Shared IBM Personal Computer
PU2.1/LU6.2
To other controllers
Shared emulator
3278
3178
3278
3279
Personal Computer
3278
Display terminals (up to 64 workstations)

* Packet assembler/disassembler

- Cohesive Networks has released T1 products for backbone networks/**68**
- Memotec Data has introduced a network management system that runs on an IBM Personal Computer XT and can be used to monitor an X.25 network/**68**
- Hewlett-Packard has announced a statistical multiplexer that connects up to 16 workstations/**69**
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HP announces local network connecting superminis, micros

PALO ALTO, Calif. — Hewlett-Packard Co. has announced HP 9000 LAN, a local-area network that connects HP's 9000 Series 500 supermicrocomputers and HP 3000 superminicomputers.

HP 9000 LAN is based on HP's Advancenet local network. HP 9000 LAN reportedly supplies an Ethernet-type interface, supports transmission speeds up to 10M bit/sec., runs on baseband media and includes multiple access collision detection facilities. The local network is said to connect up to 100 devices over a maximum distance of 500 meters.

HP 9000 LAN features file transfer capability, remote program management, interprocessor communications and remote file access.

The product consists of interface cards for each node and network software. The card costs $2,200.

For single-user HP 9000 devices, the software costs $1,700 for the first node, $850 for additional nodes. For multiuser devices, software is $4,000 for the first node, $2000 for each extra node.

HP is located at 3000 Hanover St., Palo Alto, Calif. 94304.

Seminar views communications issues

By Paul Korzeniowski
CW Staff

BOSTON — Corporations are being forced to monitor a meteoric rise in the use of communications with inadequate network management tools.

That message was delivered at "Strategic Planning for Network Management," a seminar that took place during Network Management Technical Control, a conference held here recently sponsored by the CW/Conference Management Group based in Framingham, Mass.

Wayne Hall, manager of corporate network programs at Digital Equipment Corp., monitors DEC's in-house network, which connects more than 40,000 terminals, 5,000 personal computers and 2,700 nodes throughout the world. "Our network is probably 100 times larger than any of our customers' networks," he said. "Since the network is so large, it presents us with some challenges. There are no network management packages designed for such a large system, and we can't turn to other companies to help solve a problem."

Hall's problem will become worse during the next few years as the network expands and the number of personal computer users grows to 25,000 or 30,000.

As this process evolves, network growth may be limited by network management system inadequacies. James G. Herman, director of network architecture at BBN Communications Corp. in Cambrige, Mass., noted, "As networks grow and become more complex, one may not possess the tools needed to monitor and fix them. It is similiar to the use of vacuum tubes. As vacuum tubes became the limiting factor to what a computer could do, new technologies had to be developed."

Hall concurred. "Just tracking and managing equipment used on our network has become a difficult task," he noted.

Another missing item in network management systems is a telephone cost tracking system. "Telephone costs differ throughout the world," he said. "Just determining what our telephone costs are can be a tedious process. Once these costs are determined, one must determine where costs can be cut. If we cut costs, we must substantiate those cuts. Whenever we want to spend money for enhancements, we have to show where the money is going."

Another problem is monitoring network performance. "It is difficult to separate network functions from the software that runs on the network," he said. "Do response time improvements stem

See **LIMITS** page 72

COMMUNICATIONS

System enables users to create nets with T1 facilities

CAMPBELL, Calif. — Cohesive Networks, Inc. has released the Cohesive System, products said to enable a company to create backbone networks using T1 1.54M bit/sec. digital communications facilities.

The product consists of two parts: CN-1 nodes and the operation management system (OMS).

A CN-1 node is compatible with the wideband digital services offered by AT&T, the former Bell operating companies and interchange carriers, as well as private T1 transmission equipment such as microwave, fiber-optic, satellite or coaxial media, the vendor said. T1 lines and digital transmission equipment can be connected to CN-1s through standard DS-1 interfaces.

The product supports asynchronous transmission rates from 50 to 19.2K bit/sec. Synchronous transmission through RS-232 interfaces ranges from 1,200 to 19.2K bit/sec.

Synchronous transmission rates for V.35 connections range from 1,200 to 56K bit/sec. Up to 56 RS-232 ports operating at speeds up to 9.6K bit/sec., or up to 28 V.35 connections operating at 56K bit/sec., can be attached to the network.

A CN-1 node controls different transmission facilities and devices through a timing and control scheme called automative adaptive network synchronization. Each node can reroute transmissions if a link fails.

A single OMS, consisting of a computer with 80M bytes of hard-disk storage, terminal and printer, is needed for each network. OMS enables a user to configure a network and dedicate types of lines between different nodes. It also supplies diagnostic features and provides summary reports of network usage, according to the vendor.

Cohesive System costs range from $30,000 to $70,000 per node.

More information is available from Cohesive Networks, located at 1680 Dell Ave., Campbell, Calif. 95008.

Net manager debuts, runs on IBM micro

NORCROSS, Ga. — Memotec Data, Inc. has introduced Network Control Centre (NCC), a network management system that runs on an IBM Personal Computer XT and can be used to monitor an X.25 network.

The product monitors X.25 packet assembler/disassemblers and X.25 switch concentrators and stores calling information on the microcomputer's hard disk, the vendor said. Reports on network status, use and call billing can then be generated. For example, the package will provide reports listing who used the network, how long the user was connected to it and how many packets of data the user sent on the network. The software also supplies billing information on network users.

A vendor spokesman said the package monitors the condition of each device on the network and informs a central operator whenever there is a problem.

NCC runs on a Personal Computer XT with IBM's PC-DOS 2.1 and 256K bytes of random-access memory.

NCC costs $5,000.

Memotec Data is located at Suite 105, 3320 Holcomb Bridge Road, Norcross, Ga. 30092.

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Xpert gets Uninet OK

ALEXANDRIA, Va. — Atlantic Research Corp. has announced that its Xpert terminal has been certified for use on Uninet, Inc.'s public packet-switching network.

Xpert reportedly can hold four host sessions simultaneously and emulates IBM 3270 series, Digital Equipment Corp. VT100 and Ascii terminals. Users can move from one host session to another by pressing a few keys.

Because the product was designed for packet-switching networks, the terminal does not require a packet assembler/disassembler or protocol converter, the vendor said.

Atlantic Research is located at 5390 Cherokee Ave., Alexandria, Va. 22312.

MULTIPLEXERS/ MODEMS

■ **Nokia-Kinex Corp. has announced 14400/M, a 14.4K bit/sec. modem that is said to operate over AT&T leased lines.**

The modem features synchronous operation, a variety of tail circuit applications, automatic adaptive equalization, fault isolation, performance capability, remote control diagnostics, noninterfering port diagnostics, independent monitoring of RS-232 signals on each port, dynamic real-time digital line quality monitor and bit-error rate tester.

A vendor spokesman said the product is available in single-port or multiport configurations. A single-port model has 12K and 9.6K bit/sec. fallback transmission rates. A multiport configuration allows up to four channels to send data over the same path, the vendor said.

A single-port version of the product costs $3,295.

Nokia-Kinex, 6950 Bryan Dairy Road, Largo, Fla. 33543.

■ **Astrocom Corp. has introduced a modem emulator that operates either separately or combined with RS-232 and V.35 interfaces.**

The modem emulator replaces two back-to-back modems and can provide RS-232-to-V.35 interface conversion. The V.35 interface allows synchronous devices to communicate at distances of up to 2,000 ft. The emulator runs asynchronously at speeds up to 57.6K bit/sec. or synchronously at switch-selectable speeds of 2.4K, 4.8K, 9.6K, 19.2K, 38.4K, 56K or 57.7K bit/sec.

Single-quantity prices are $367 for the RS-232 stand-alone version and $235 for the circuit card version. The optional V.35 interface unit is $419 for the stand-alone version, $285 for the circuit card version.

Astrocom, 120 W. Plato Blvd., St. Paul, Minn. 55107.

■ **Nokia-Kinex Corp. has announced the 9600/FP, a 9.6K bit/sec. diagnostic modem that can monitor up to 15 remote devices on a multidrop line.**

The 9600/FP reportedly enables users to perform remote polling tests and a universal test that simulates polling performance of a multipoint network. It is said to feature a built-in network diagnostic system, automatic retrain on remote modems, automatic antistreaming, fault isolation and performance monitoring. The modem supports synchronous half-duplex or full-duplex communications.

The modem's retraining cycle during each poll of a multipoint line takes 30 msec, the company reported.

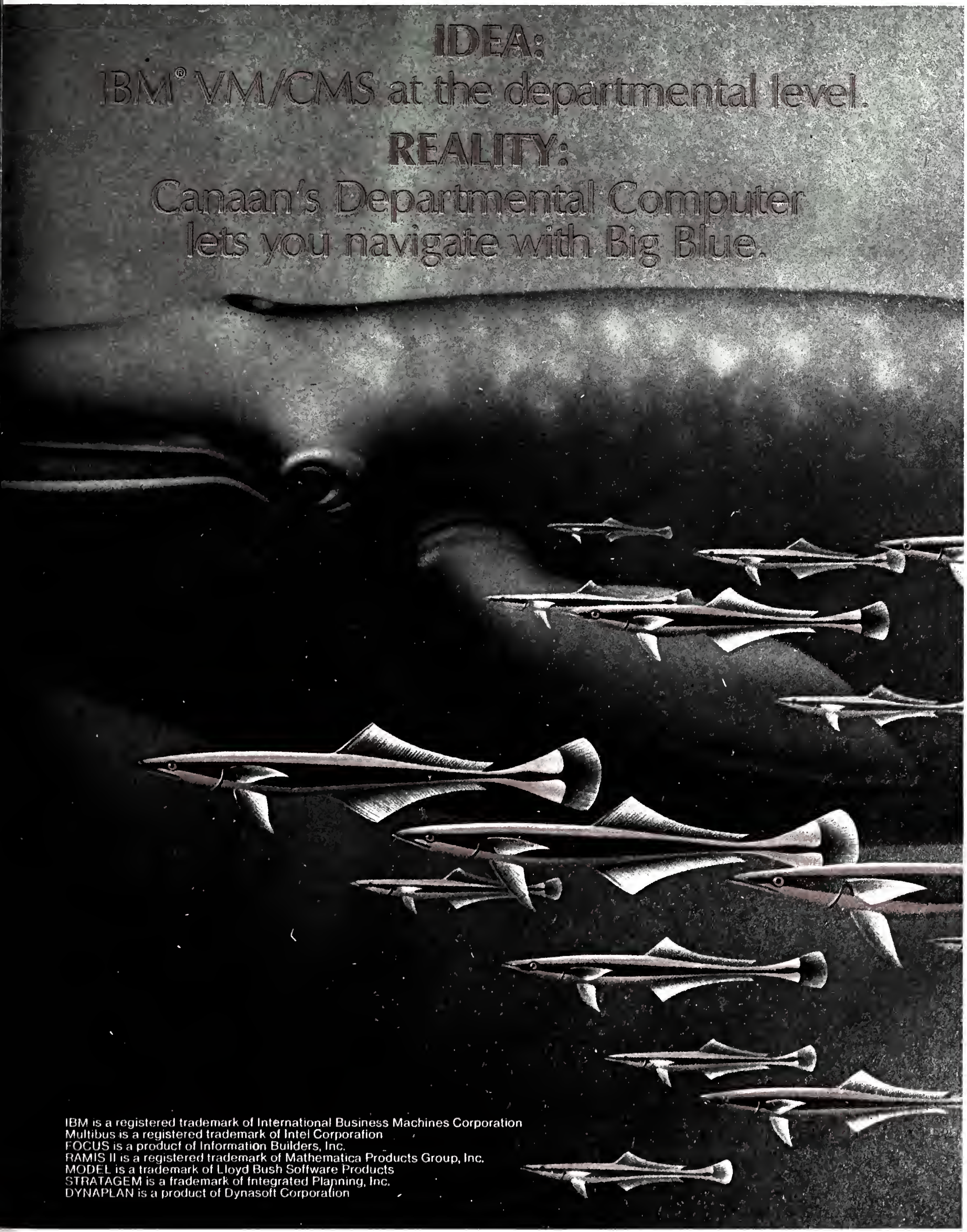
The 9600/FP costs $2,575.

Nokia-Kinex, 6950 Bryan Dairy Road, Largo, Fla. 33543.

■ **Hewlett-Packard Co. has announced HP 2334A, a statistical multiplexer that connects up to 16 workstations.**

The product is said to work with analog or digital leased lines, dial-up lines or

Continued on page 70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Continued from page 69

X.25 packet-switching networks. The HP 2334A transmits data at speeds up to 19.2K bit/sec. and supports port speeds to 9.6K bit/sec.

The full-duplex, asynchronous product may be integrated into an X.25 network, the company reported. For example, HP 2334A can be connected to an HP 3000 series or HP 1000 series minicomputer and act as a remote X.25 workstation cluster controller, according to the vendor.

HP 2334A prices range from $2,500 for a four-port version to $5,000 for a a 16-port model.

HP, 1820 Embarcadero Road, Palo Alto, Calif. 94303.

■ **Xel Communications, Inc. has introduced a combination data service unit and channel service unit for use with AT&T's Dataphone Digital Service network.**

The product, Daphne, includes three loopbacks and a self-test feature. An eight-position modular jack makes it possible to interface with other networks, the vendor said.

The 8500-000 version transmits data at 2,400, 4.8K and 9.6K bit/sec. It is priced at $795. The 8500-001 model transmits data at 2,400, 4.8K, 9.6K and 56K bit/sec. and lists for $895.

Xel Communications, 17600 E. Exposition Drive, Aurora, Colo. 80017.

■ **CTS Fabri-Tek, Inc. has introduced three modems, CTS 4827, CTS 9629 and CTS 14.4MX, to its product line.**

The modems feature adaptive equalization, front-panel programmability and LCD status, the vendor said. The products are designed for four-wire leased lines and operate in either half-duplex or full-duplex mode.

CTS 4827 transmits data at 2,400 bit/sec. or 4.8K bit/sec. and features phase shift frequency modulation. CTS 9629 works at speeds of 4.8K bit/sec., 7.2K bit/sec. or 9.6K bit/sec., and the CTS 14.4MX transmits data at 4.8K bit/sec., 7.6K bit/sec., 9.6K bit/sec. or 14.4 bit/sec. Both CTS 9629 and CTS 14.4 work with quadrature frequency modulation.

CTS 4827 costs $1,395, CTS 9629 sells for $1,745, and the CTS 14.4MX is priced at $4,995, which includes a six-channel multiplexer.

CTS Fabri-Tek, 6900 Shady Oak Road, Eden Prairie, Minn. 55344.

LOCAL-AREA NETWORKS

■ **Data General Corp. has introduced a software I/O driver that allows most DG Eclipse/MV superminicomputers to access Network Systems Corp.'s Hyperchannel local-area network.**

The software driver runs under DG's AOS/VS operating system and enables the DG processors to be interconnected in a multivendor environment using the coaxial cable-based Hyperchannel network. Systems that can be supported include equipment from IBM, Digital Equipment Corp., Control Data Corp., Honeywell, Inc. and others, the spokesman said.

The AOS/VS Hyperchannel Driver is priced at $8,640.

DG, 4400 Computer Drive, Westboro, Mass. 01580.

■ **Digital Microsystems, Inc. (DMS) has announced Univac Hinet Gateway, which is said to provide synchronous communications between DMS Hinet local-area networks and Sperry Corp. 1100 mainframes.**

DMS' Hinet is a baseband network that supports up to 63 users and has a transmission speed of 500K bit/sec. With the product, terminals or personal computers supported on a Hinet network emulate Sperry Uniscope 20 terminals. The device is also said to support file transfers between the network and the mainframe.

Univac Hinet Gateway costs $4,995.

DMS, 1755 Embarcadero, Oakland, Calif. 94606.

■ **Massachusetts Computer Corp. (Masscomp) has announced an enhanced version of its Multibus interface for the Ethernet network. It is designed for Masscomp 500 series 32-bit computer systems.**

The interface is said to offer throughput performance in excess of 90K byte/sec. Transmission control protocol is reportedly implemented on the board, off-loading the CPU of all packing, unpacking and retransmission of user data, Masscomp said. The interface reduces CPU cycle requirements for typical Ethernet applications to 0.5%, according to the vendor.

The interface is based on an Excelan, Inc. Exos-201 module and the most recent versions of Ethernet software and the Masscomp RTU operating system.

The product is priced at $3,900, the vendor said.

Customers using the previous Ethernet interface may upgrade for $2,500.

Masscomp, 1 Technology Park, Westford, Mass. 01886.

■ **Bridge Communications, Inc. has announced Gateway Server/4 (GS/4), an Ethernet-to-Ethernet gateway that can be used to tie local network segments together into a net up to 40 km long.**

Placed between Ethernet local-area networks, the product can connect networks using coaxial or fiber-optic media and overcome the 2.5-km limitation of most Ethernet networks, the vendor said.

The product overcomes the limitation with a packet/repeat function that automatically restarts the carrier-sense multiple access with collision detection algorithm on each net-

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COMMUNICATIONS

work. GS/4 filters network traffic between local-area networks and automatically balances traffic loads and reduces delays, Bridge Communications said.

The product's network management facilities provide information on collisions, cycle redundancy checks, alignment errors and byte and packet throughput.

GS/4 uses three Motorola, Inc. 68000 microprocessors, two for the controller and one for network protocol. The product provides internetwork throughput of 350 packets or 1.75M bit/sec., according to the vendor.

The product costs $9,900 plus a $150 annual software license fee, the vendor said.

Bridge Communications, 1345 Shorebird Way, Mountain View, Calif. 94043.

NETWORK SERVICES

■ **Memotec Data, Inc. has announced SP-830, a packet assembler/disassembler (PAD) designed for X.25 networks.**

The product reportedly provides statistical multiplexing features that enable up to four asynchronous ports to be supported over a single link. Each port can transmit data at speeds from 75 bit/sec. to 9.6K bit/sec. with the X.25 data link supporting transmission speeds from 1,200 bit/sec. to 9.6K bit/sec.

The product conforms to CCITT X.25, X.3, X.28 and X.29 standards, the vendor said. SP-830 features autospeed, autoparity, autoconnect, port hunt groups and support for Digital Equipment Corp. VT100 terminals.

The PAD weighs 5 lb and includes an external power supply.

SP-830 costs $1,715.

Memotec Data, 600 McCaffrey St., Montreal, Quebec H4T 1N1.

TEST EQUIPMENT

■ **Tektronix, Inc. has added two devices, the 836 and 835, to its line of portable data communications analyzers.**

Both devices are said to provide line monitoring, interactive exercising and simulation and data link testing for bisynchronous, asynchronous, X.25, Synchronous Data Link Control and high-level data link control networks, the vendor reported.

The 836 operates full duplex at data transfer rates of up to 72K bit/sec. and half duplex at 144K bit/sec. The 836 features a data transfer capability that allows buffer contents and read-only memory data to be exchanged between an 836 and a host system, the vendor said. A user can store setup features, captured data and programs in the product's nonvolatile memory.

The 835 operates at speeds of up to 19.2K bit/sec. and is upgradable to the 836.

The 836 costs $4,650, and the 835 sells for $3,350; both products are available in rack-mounted versions.

Tektronix, P.O. Box 500, Beaverton, Ore. 97077.

■ **Dynatech Data Systems has announced Prism, a real-time network performance and management system.**

Prism is said to measure performance on from 16 to 2,048 lines, each operating at speeds up to 64K bit/sec. The lines can support a number of protocols including bisynchronous and Synchronous Data Link Control.

Status reports can be read at a terminal or sent to a printer or plotter. Reports using real-time or historical data can be used to monitor or change a user's configuration. Other reports, including weekly performance summaries, can be generated automatically by the system or by the user.

Prism consists of a Convergent Technologies, Inc. N-Gen or Megaframe workstation, a Hewlett-Packard Co. plotter and Dynatech software.

Dynatech said that the system costs between $2,000 and $5,000 per port. The product will be available in the fourth quarter of this year.

Dynatech, 7644 Dynatech Court, Springfield, Va. 22153.

AUXILIARY EQUIPMENT

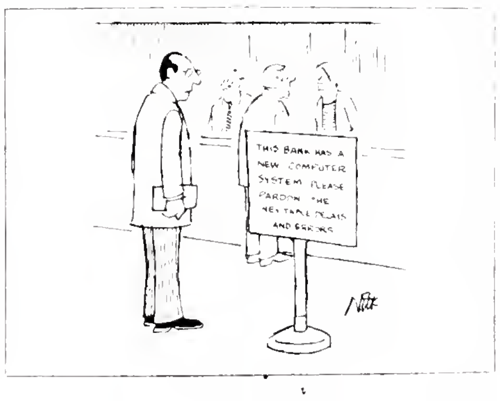
■ **NSI Corp. has announced PBX Performance Monitor, a software package that runs on an IBM Personal Computer that is said to translate error codes generated by private branch exchanges into plain English statements.**

A personal computer with the software can be attached to the maintenance port of Rolm Corp., Northern Telecom, Inc. or AT&T PBXs. Error messages are written to the computer which, through the program, translates the codes into English so that a maintenance technician does not have to look up each code.

If a serious problem occurs, the product flashes an alarm condition and sounds an alarm through the micro's speaker. In addition, the product supplies daily, weekly, monthly and yearly summaries.

PBX Performance Monitor costs $1,500.

NSI, Box 1, 1919 S. Shiloh, Garland, Texas 75042.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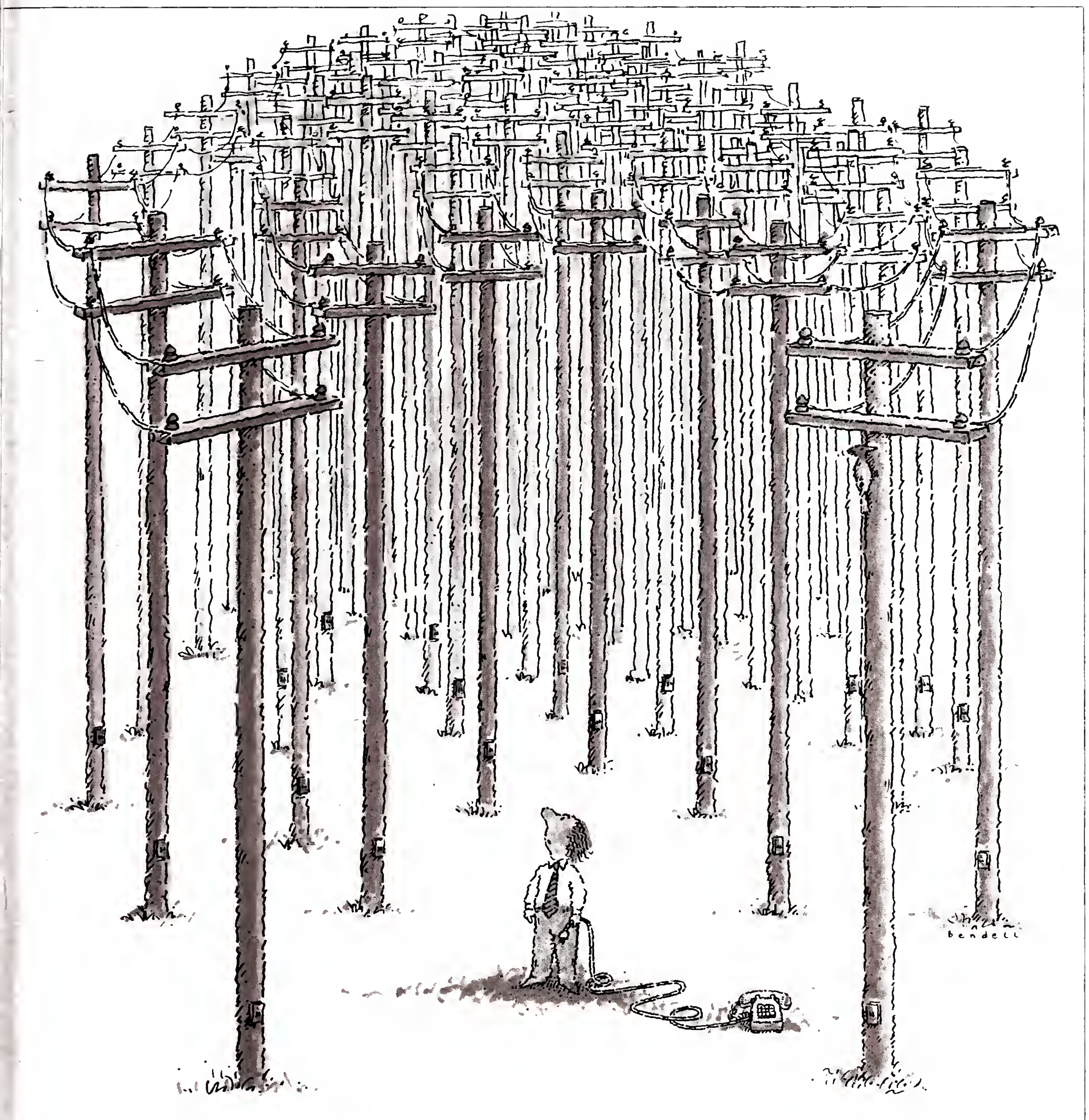

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coupled with an upgraded logical unit type, LU 6.2, the controller would have intersystem communications capabilities. This would enable the controller to establish sessions between attached workstations, including IBM Personal Computers, and make it possible to support sessions between local devices and workstations supported by remote PU 2.1 controllers without having to route the traffic to a higher level host.

Personal Computers will, in fact, probably have a great deal to do with the capabilities of the 3274 replacement. The asynchronous Ascii devices do not coexist neatly in the realm of 3270-type synchronous Ebcdic devices. That fact gave birth to a whole submarket for boards that enable Personal Computers to emulate 3270 workstations.

Instead of emulating 3270 workstations at each Personal Computer, IBM may put a shared 3270 emulator in the upgraded controller. Besides the cost advantage of a shared device, such a capability may enable the Personal Computers to be supported with twisted-pair wire instead of coaxial cable.

To minimize the number of micros needed, a 3270 replacement may also support a shared Personal Computer. This would enable, for example, 3278 workstation users occasional access to a micro.

Other capabilities that IBM may incorporate into a 3274 replacement include alternate types of host and workstation connections.

The upgraded box will likely be built using the IBM Cabling System — a building wiring scheme — and future IBM local network products in mind. Today's 3274 can be used with the balanced twisted-pair wire used in the Cabling System, but small adapters are needed to interface the controller's coaxial cable connectors to the telephone-like wire. Certain models of the controller may be available that can directly accept the balanced twisted pair.

IBM may also make it possible to string together multiple workstations with a single cable, possibly with a loop facility or a cable-through capability similar to that used on its System/34, 36 and 38 processors.

On the link side of the controller, analysts expect IBM to provide multiple-host connections, enabling supported devices to access applications simultaneously on different processors without going through a remote front-end processor.

Finally, for its controllers used locally, IBM may offer a fiber-optic interface to replace IBM channel bus and tag cables.

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from changes in applications software or network enhancements?"

Network management could be an important management tool, but today's packages do not provide reports needed to evaluate a business. "We would like to monitor end-to-end transmission of messages," Hall stated. "That capability would give us a good look at how the corporation is operating. Today, only node-to-node reports are available."

Herman added, "If one can monitor who is working with what information, one gains an insight into how the corporation is operating."

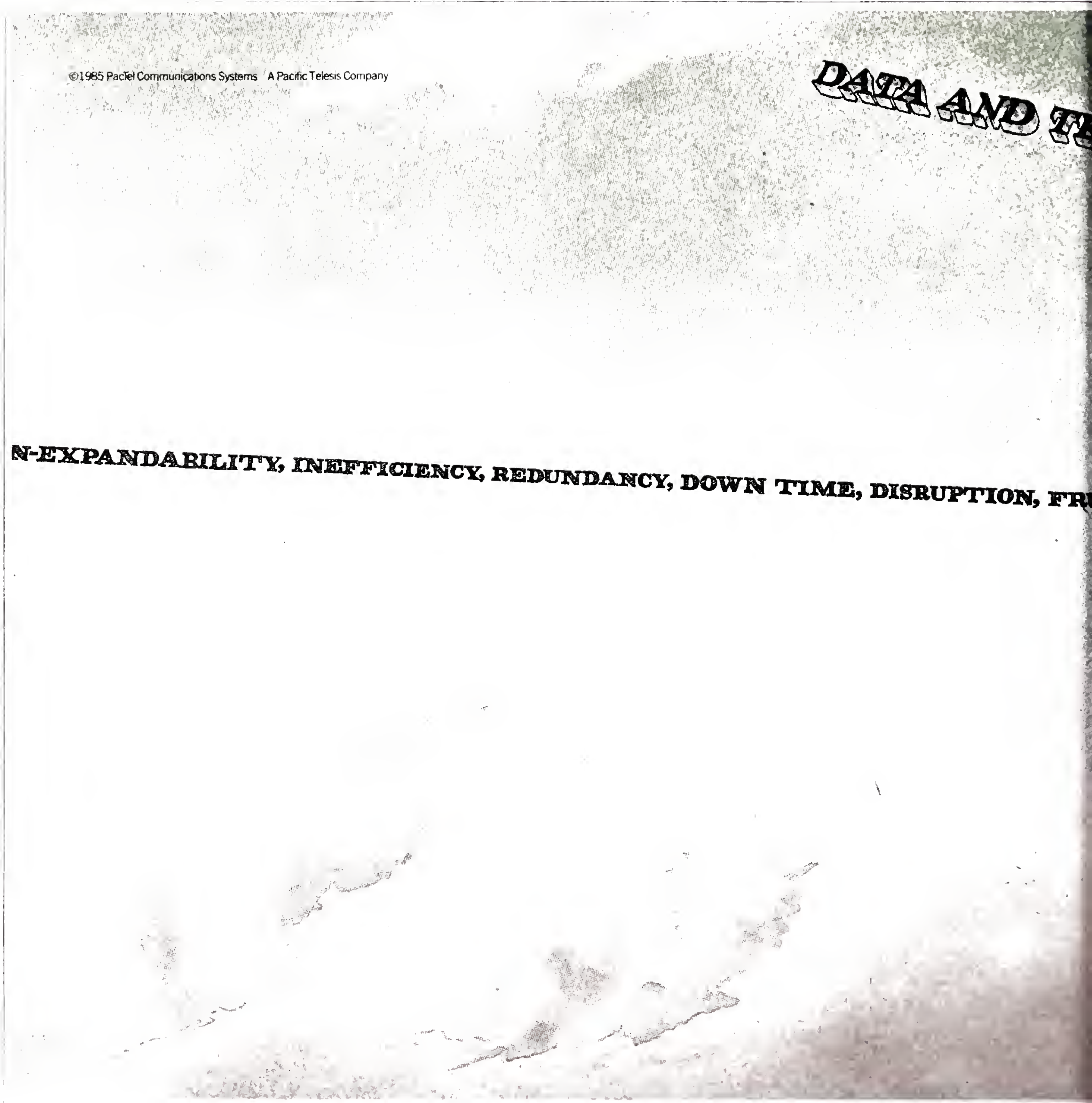
Steps to alleviate limitations

Although today's network management tools are inadequate, Hall listed steps to help alleviate the limitations.

First, he claimed that companies should build flexibility into a network. "New applications will be developed, departments will move to other areas and departments will be reorganized," Hall said. To solve these problems, he recommended that all buildings be wired with a common network topology. "A user should be able to plug into the network no matter where he is working." Yet, this approach is expensive, Hall said.

Another aid is assigning someone with network manager responsibilities at each node. Each manager is supplied with a tool kit that includes software tools, documentation, training materials and network policy guidelines. "The tool kit prevents different departments from having to reinvent the wheel," Hall noted.

Hall concluded that these steps can only be moderately successful because real-time maintenance and security tools are not yet available.


DATA AND T
N-EXPANDABILITY, INEFFICIENCY, REDUNDANCY, DOWN TIME, DISRUPTION, FR

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MODEL

from page 67

populations.

■ Network models also assume that blocked calls are not retried, when in fact these calls are rarely lost and may indeed be retried within seconds, particularly with autodialers, CPU-originated traffic and camp-on routines of smart message terminals or switches.

For example, a typical problem recently analyzed by this author consisted of a CPU in a metropolitan area calling a sparse population of terminals in a smaller city to deliver electronic mail. After receiving messages from the sender, the CPU was programmed to attempt to route the message within one minute for up to 50 tries — with the interval made slightly longer as the number of attempts increased — before rescheduling the call.

In other words, the model suggested use of fewer communications facilities for this application than were actually needed because of the number and frequency of the retries.

■ Another assumption made with optimization models is that traffic patterns are consistent, when in fact they vary by the time of day and week and by the source of the traffic.

Even discounting the first and second points above, there is no guarantee that a given population will behave with any certainty in an intrinsically smooth fashion. Monday and Friday morning traffic may resemble shock waves. And CPU-generated traffic may be almost deterministic at high load — as when a buffer fed by bulk storage empties out to a line every 10 msec — and bursty at lighter loads.

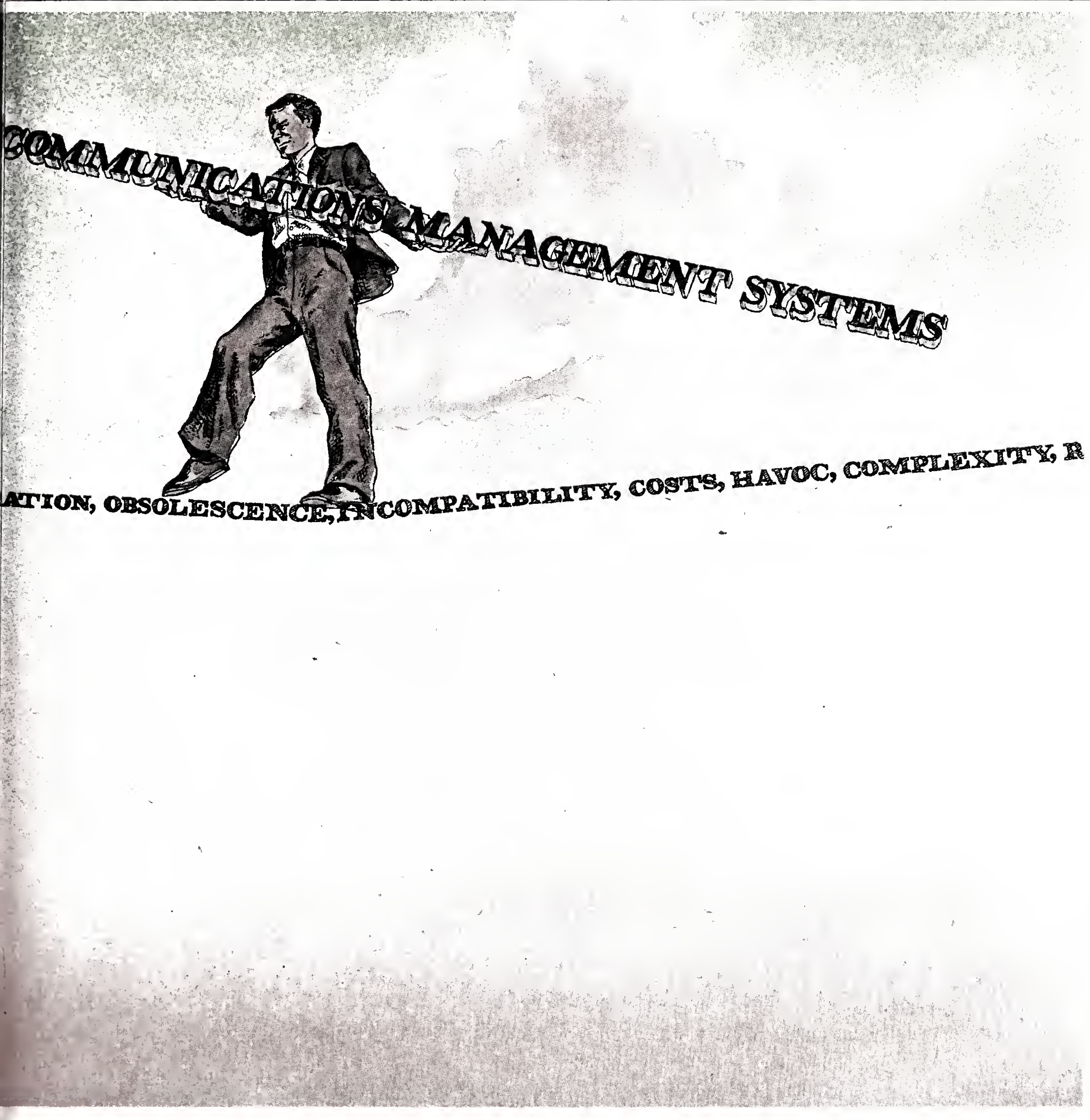
Generally the traffic may be mixed from several radically different sources, including data and voice input to a private-branch exchange and incoming local telephone traffic vs. incoming national toll traffic vs. incoming international traffic. Holding times may be a function of the time of day, message content and other factors. Traffic patterns at business centers differ from those characteristic of rural and semirural areas.

■ A last assumption made in many optimization models is that all users are independent of each other, when in fact the opposite might be true. Consider the problem of determining the number of foreign exchange lines needed between a centralized customer service center and a node in a star-configured data communications network. All data customers go through a concentrator in the remote city. A failure in the concentrator or communications line would prompt all customers in the given city to call the centralized customer service center. These calls would not be independent of each other.

> ”
>
> *Practitioners who design networks must make dozens, if not hundreds, of assumptions and engineering judgments often ignored by optimization models.*

Practitioners who design networks must make dozens, if not hundreds, of assumptions and engineering judgments often ignored by optimization models. In the end, they may very well wonder if the cumulative sum of all errors — a few of which were described above — suggests use of the incorrect number of facilities. Indeed, the issues described above may be in part responsible for the degraded service sometimes experienced by a number of public and private networks.

Yet, one rarely finds these issues treated in the thousands of queuing models available. In particular, very little is done in modeling that addresses customer behavior, not only in the traffic area but in market dynamics, vendor loyalty, tariff and pricing sensitivities and reaction to quality/degradation of service.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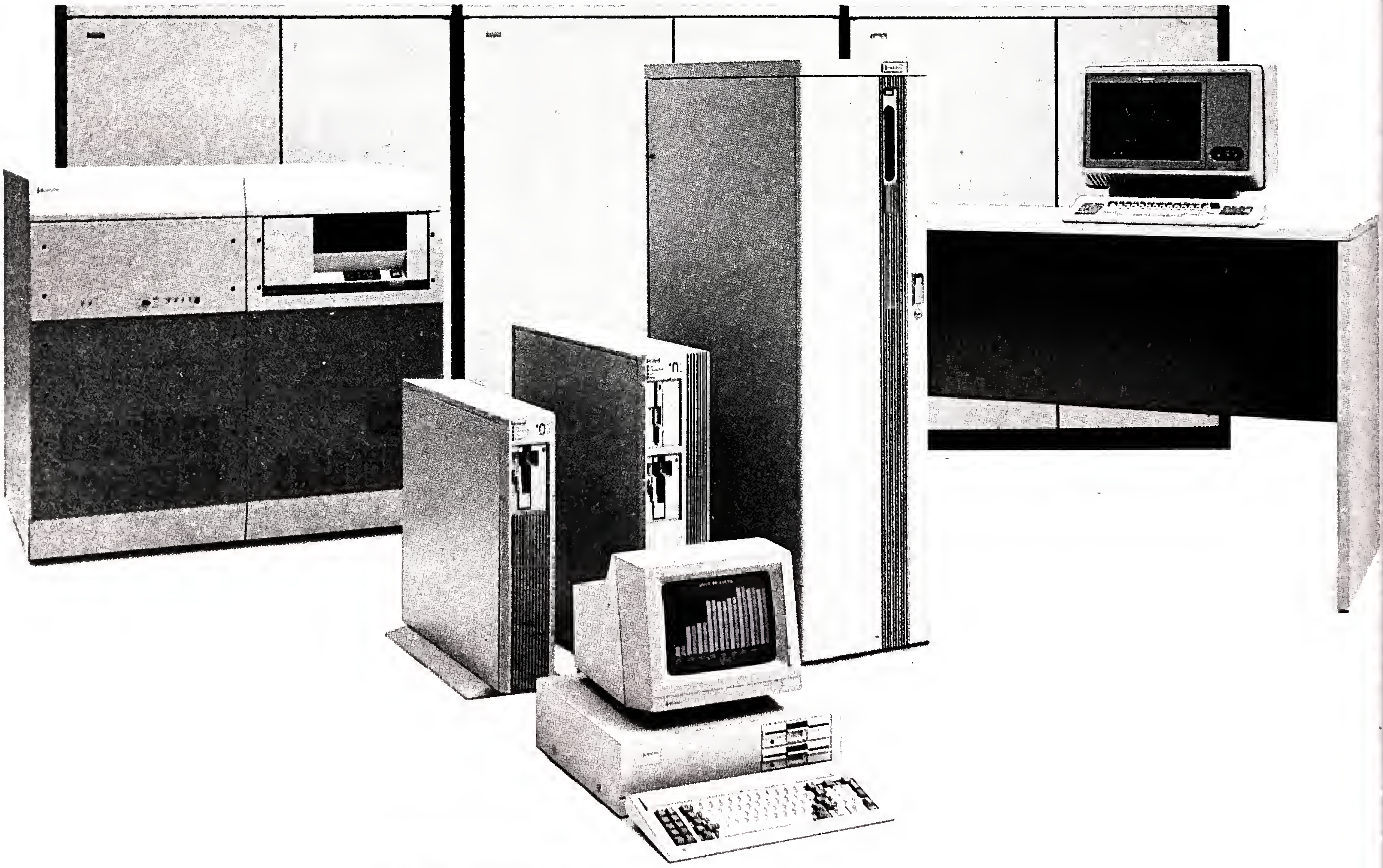

The UNIX* operating system from PC to mainframe.

SYSTEMS & PERIPHERALS

Wait dulls STC 8380E luster

By Charles Babcock
CW New York Bureau

ANALYSIS

NEW YORK — Claiming the bad times are over and the good times are about to roll, Storage Technology Corp. (STC) made official its plans to counter IBM's dual-capacity 3380 disk drive with the 8380E, a field-upgradable version of its 8380 disk drive that industry watchers said has one significant flaw: It will not be available until a year after IBM begins volume shipments of its double-capacity 3380s.

The 8380E, with 5.04G bytes of storage, a 17-msec access time and a data transfer rate of 3M byte/sec., matches IBM's 3380 double-capacity drive announced in February. In fact, STC's and IBM's approaches to the double-capacity drives are similar. Both retained the thin-film read/write heads that caused problems in early versions of the 3380 and 8380 drives. And both companies created the double-capacity models by increasing the ratio of tracks per inch on the unit's disk platters (STC threw in a slightly larger disk platter in its 8380E).

But there are also glaring differences between the two products. STC's drives are field upgradable. Current 8380 users can convert their drives to the 8380E models by replacing 12 circuit boards, the head disk actuator and the drive motor. Since the components fit into the same cabinet, no additional space is required for the double-capacity unit, STC said.

IBM's dual-capacity 3380s are only upgradable from single-capacity 3380s announced in February. Users of older 3380s cannot upgrade to the double-capacity

See **STC** page 80

HARD TALK
Tom Henkel
CW Senior Editor

STC, Memorex: Grim futures?

Storage Technology Corp. (STC) and Memorex Corp., generally viewed by industry watchers as being among the more tenuous companies in the IBM-compatible products business, both unveiled answers to IBM's double-capacity 3380 disk drive recently, ironically choosing the same New York restaurant in consecutive weeks to make their announcements.

See **DRIVES** page 82

- Here's looking at you! Study says vision robots are on their way/**76**
- General Automation unveiled two supermicrocomputers based on the Pick operating system/**76**
- Computer Consoles released a floating-point accelerator for its Power6 family of minicomputers/**78**
- National Advanced Systems unveiled a circuit board said to link IBM Personal Computers to SNA/**79**

INSIDE

Processors/**78**
Terminals/**78**
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Board-Level Devices/**79**
Auxiliary Equipment/**79**

NCR introduces low-end, multiuser Minitower

DAYTON, Ohio — NCR Corp. has added a low-end addition to its Tower line of supermicrocomputers called the Minitower, a system that can support from two to eight users.

Based on Motorola, Inc.'s 68010 microprocessor, the Minitower supports NCR's derivative of AT&T's Unix System V operating system, Tower Operating System V. The unit is software compatible with two larger members of the Tower family, the Tower and Tower XP, but comes in a cabinet that is 33% smaller than the earlier models, the company said.

The Minitower reportedly can function as a stand-alone, entry-level system or as part of a distributed network supporting IBM Synchronous Data Link Control or X.25 protocols. The Minitower's Towernet communications package can interface with an Ethernet local-area network via the Xerox Network Service link-level protocol.

In an IBM Systems Network Architecture (SNA) environment, the Minitower can function as a Physical Unit Type 2 cluster controller node. Also, when operating under SNA, users can add various emulation packages that allow the Minitower to function as an SNA RJE device, emulate an IBM 3270 terminal or emulate an IBM 3278 printer, the vendor said.

With a base price of $6,995, the Minitower features 512K bytes of main memory, 25M bytes of Winchester disk storage,

See **NCR** page 82

Wang enhances small business CPUs, operating system

LOWELL, Mass. — Wang Laboratories, Inc. unveiled two very large-scale integration-type (VLSI) versions of the company's 2200MVP small business system and an enhanced release of its multiuser operating system that can be used on the entire 2200 product line. The company will no longer sell the non-VLSI 2200MVP CPU, a spokeswoman said.

The price of the VLSI-type 2200MVP — CPU only — is $4,950 for 128K bytes, which is said to be a $850 reduction from previous 128K-byte MVP CPUs. The 512K-byte model costs $7,300, a $3,000 reduction from previous 512K-byte MVP CPUs. A system configured with 128K bytes of memory, a terminal, a triple controller that can attach to a terminal, a disk drive and a parallel printer, one 5¼-in., 10M-byte disk and a 320K-byte floppy drive costs approximately $8,000, the vendor said.

The company claimed up to a 70% reduction in monthly maintenance for the VLSI-type CPUs, from a range of $87/mo to $205/mo for the previous MVP CPUs to a range of $42/mo to $67/mo for the VLSI-type MVP CPUs.

The 2200MVP and the Micro VP CPUs employ processors from VLSI Technology, Inc. of San Jose, Calif., which are said to allow the replacement of from seven to nine 8- by 11-in. printed-circuit boards with a single board that includes 32K bytes of control memory.

The VLSI-type 2200MVP (available now) combines the newly announced board in the traditional 2200MVP packaging, and the Micro VP, available in July, features smaller packaging. Each system accepts nine optional peripheral controller

See **WANG** page 82

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*Based on inventory for Vehicle Leasing and Services Division, which does business as Ryder Truck Rental, source 1983 Ryder Systems, Inc. Annual Report and Third Quarter Report, 1984

Report foresees dilating vision-capable robot mart

Systems more flexible, safer but expensive

By Donna Raimondi
CW Staff

NORWALK, Conn. — To see or not to see? That is the big question for robot users in the next few years.

About 60,000 of the 250,000 industrial robots purchased in the next 10 years will be equipped with vision capabilities, according to a report, "Robot Vision Systems," issued by International Resource Development, Inc. here.

Vision-capable robots will be able to operate with much more flexibility and safety than "blind" robots, the report said. But they're expensive, each costing roughly $150,000 now. The report also stated that the cost of robots that can see will fall rapidly as they become more common.

Buyers are skeptical

Early robot vision systems have been plagued by reliability problems and design bugs, the report said, and buyers are "rightly skeptical" of vendors' performance claims.

Robot vision systems use television cameras or charged coupled-device scanners, with the output from either passing through image processing and data processing subsystems. The camera or scanner can be mounted in the body of the robot (eye in shoulder) or in the robot's grippers (eye in hand), the report said. The robot's performance is strongly determined by the power of the signal processing electronics, the report added.

Older versions of seeing robots needed careful floodlighting or backlighting of the work area, the report noted. Later model seeing robot versions include signal processing semiconductor sets with special image processing capabilities that reduce the need for specialized work area lighting.

Far too many vendors are aiming at the robot vision system market, the report said, identifying more than 15 serious participants. As the market grows, "the heavyweights are moving in," it added. "General Electric Co., General Motors Corp. and IBM may soon have pushed out or acquired most of the smaller firms."

Continue to cost more

Vision-capable robots will continue to cost substantially more than blind robots, but the total installed price to users is sometimes less, the report observed.

Blind robots require special conveyors and other systems to present work pieces at precisely the right time and in the right place. Vision-equipped robots need fewer special fixtures around them, it said. They can pick parts out of bins, orient them correctly and more easily recognize problem conditions and emergencies, such as the presence of a human in the work area.

The report, which costs $1,850, can be obtained from International Resource Development at 6 Prowitt St., Norwalk, Conn. 06855.

CW CHART

TOP ROBOTIC VISION SYSTEM VENDORS

Automatix
General Electric Co.
(Industrial Vision Systems Division)
Intelledex, Inc.
GMF Robotics, Inc.
Machine Vision International
Robotic Vision Systems, Inc.
Asea, Inc.
Object Recognition Systems, Inc.

Source: IRD

Supermicro firm unleashes Zebras

ANAHEIM, Calif. — General Automation, Inc. has introduced the Zebra 1750 and Zebra 6700 supermicrocomputers. Both machines are based on the Pick Systems Pick multiuser operating system, according to General Automation.

The Zebra 1750 is said to support from six to 12 terminals and to offer 128K bytes to 1M byte of memory with zero wait states and 20M bytes to 120M bytes of hard-disk storage. Also available is a 5M-byte removable cartridge disk drive and/or a ¼-in. streaming cartridge tape drive for backup.

The 6700 reportedly features the Motorola, Inc. MC68000 microprocessor, 1.2M bytes of memory (expandable to 3.25M bytes), 260M bytes of hard-disk storage and support for up to 64 users.

Also included is a backup battery power supply and a security key switch among other features, according to the vendor.

The Zebra 1750 is priced at $9,950. The Zebra 6700 is priced at $86,500, the vendor said.

More information is available from General Automation, located at 1045 South East St., Anaheim, Calif. 92803.

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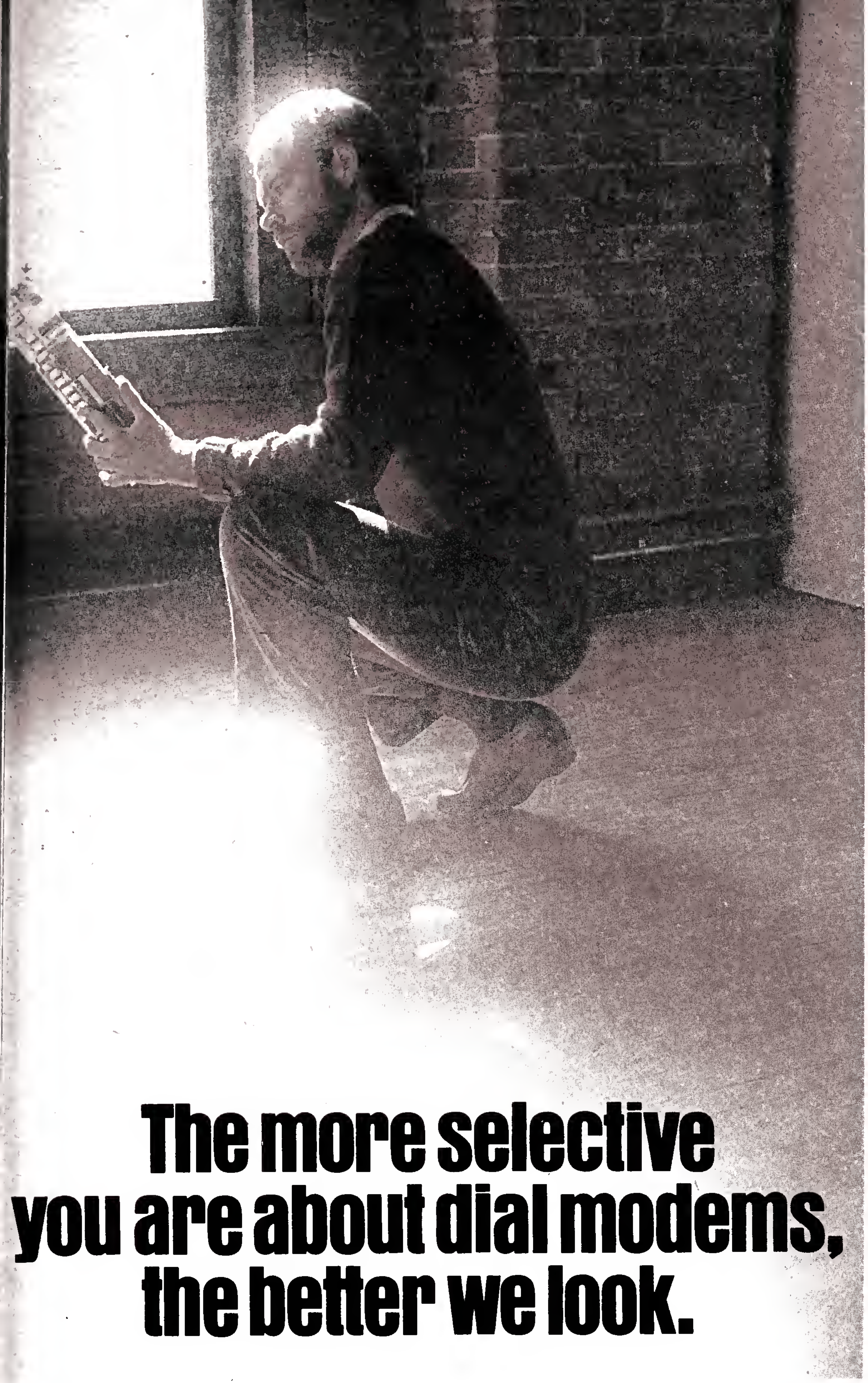
* Upon receipt of this form, detailed information will be sent to you for selection of specific tutorial sessions. Registrations cancelled later than June 14 are subject to a $50.00 service charge. Registration may be transferred at no charge.



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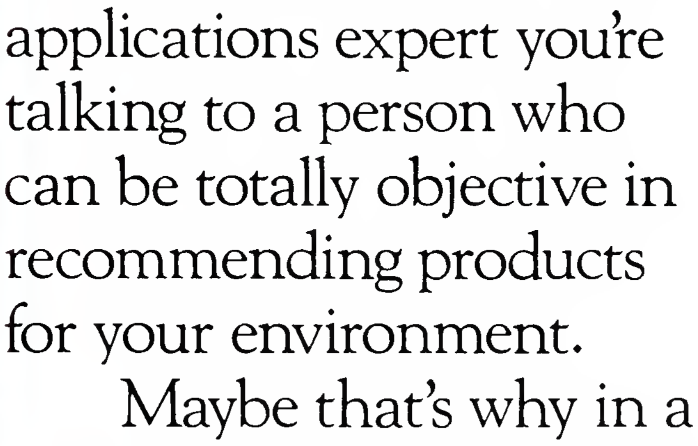

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PROCESSORS

■ **Computer Consoles, Inc. has released its Floating Point Math Accelerator, an addition to its Power6 family of minicomputers that runs under either the University of California at Berkeley 4.2 BSC or AT&T System V versions of the AT&T Unix operating system.**

The Floating Point Math Accelerator is a coprocessor that can be installed in a Power6 system to give floating-point capabilities. The accelerator is said to speed execution of math functions, such as sine, cosine, arctangent, log, exponent and square root.

The accelerator option costs $16,500, and it will be available in the second quarter of 1985.

Computer Consoles, 97 Humboldt St., Rochester, N.Y. 14609.

■ **Orcatech, Inc. has announced its Advanced Graphics Processor (AGP), which is a replacement for the existing graphics processor in the Orca 3000 and 3050 AT&T Unix-based graphics workstations.**

Combined with the Unix system and the Programmer's Hierarchical Interactive Graphics Standard implementation, the AGP is said to provide users with a two- and three-dimensional graphics engine.

The processor is a three-board set that consists of a display list processor, a transformation and floating-point processor and a drawing processor.

The unit costs approximately $10,000, and it will be available in the fourth quarter of 1985.

Orcatech, 1000 Morrison Drive, Ottawa, Ont. Canada K2H 8K7.

■ **AMF Logic Sciences, Inc. — a subsidiary of AMF, Inc. — has announced its Turbograph 300 vector-to-raster graphics processor that was designed for OEMs and systems integrators.**

The Turbograph 300 can produce lines in formats such as solid and dashed, polygons with user-definable shading and color patterns, circles and ellipses and color and gray-level control. The display can be scaled and rotated, the vendor said.

Standard input memory is 128K bytes and can be upgraded to 512K bytes to store up to 80,000 vectors. Connections are available for the RS-232C serial interface, Centronics Data Computer Corp.'s 8-bit parallel interface or other interfaces as specified by the OEM. Options include an integral board for the IBM Personal Computer, an integral printer/plotter board and a standalone desktop cabinet for storage.

The retail price is $1,995 with discounts for OEMs.

AMF Logic Sciences, 10808 Fallstone Road, Houston, Texas 77099.

"Well, at least it wasn't a foreign computer that replaced me."

TERMINALS

■ **Intecolor Corp. has announced its Model 6120 color graphics terminal that is compatible with Digital Equipment Corp.'s VT100 and Tektronix, Inc. 4010 terminals.**

The terminal has 1,024- by 768-pixel resolution and can display 64 colors simultaneously. Graphics commands such as pan, zoom and polygon fill are built in, according to the vendor.

The terminals cost $5,875 each.

Intecolor, 225 Technology Park, Norcross, Ga. 30092.

■ **Versatec has released an engineering workstation for its computer-aided engineering/computer-aided design system line that runs all Versatec Expert engineering applications software modules and Xerox Corp. Star office automation software.**

The 8011 workstation has 768K bytes of main memory, a 1.2M-byte double-sided, double-density floppy disk drive and a 10M-byte Winchester disk drive. Upgrades include a 42M-byte Winchester disk and a 1.5M-byte main memory.

Features include 800- by 1024-pixel resolution, multiple windows, menus, optical mouse and internal Ethernet interface, the vendor said. Using the Expert VAX Ethernet interface, the workstation can access Digital Equipment Corp. VAX series programs and data, move Expert files to VAX for processing and display VAX applications and results in the workstation's VAX window.

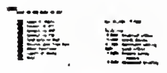
The workstation costs $8,995 for the basic system, and the workstation with expanded memory is $10,995.

Versatec, 2710 Walsh Ave., Santa Clara, Calif. 95051

Where program
their

If you want to take a look at programming from a different point of view, take a look at a Smart Desk equipped with an IBM 3270 Personal Computer.

The screen of the 3270 PC can be divided into several windows—including multiple PC sessions and up to four host sessions from the same or different computers.



In the blue window you can keep a menu of your function keys. It's easy to log on and connect to a host system for browsing a program listing in the yellow window.

To edit a second program, a single function key can download the source code to a PC session in the red window.

And, when you're finished editing, another function key can send the revised program back to the host.

These multiple windows are available in eight colors. They are ideal for reviewing more than one program at once. Or for the concurrent viewing and testing of source code.

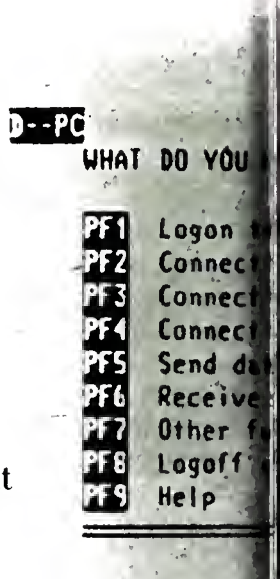
The end result is faster and more accurate programming with less demand on the host.

Any window can be viewed full screen for detailed analysis. Or it can be sized and moved to any area of the screen, so you can create the screen format that works best for you. You also get two handy notepad windows.

And, of course, the 3270 PC is backed by IBM's commitment to service and support.

One more point to keep in mind: The 3270 PC is available in quantity discounts. Your IBM marketing representative has all the details.

And if you want to receive literature on how the 3270 PC can expand your programming capabilities, call 1 800 IBM-2468, Ext. 90 or send in this coupon.



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SYSTEMS & PERIPHERALS

POWER SUPPLIES

■ **Ault, Inc. has released a 50W switcher power supply that is suitable for powering computer peripheral equipment, disk drives, CRT displays, microprocessors, multiplexers, modems and other data communications equipment.**

The plug-in supply delivers 5A at 5V dc, 2A at +12V dc and 0.5A at -12V dc, according to the vendor.

It costs $90 in OEM quantities.

Ault, 1600 Freeway Blvd., Minneapolis, Minn. 55430.

BOARD-LEVEL DEVICES

■ **National Advanced Systems, Inc. (NAS) has unveiled the Single Board Solution, a circuit board that is said to provide a communications link between IBM Personal Computers or compatible microcomputers and IBM Systems Network Architecture host processors.**

The board uses one slot in a Personal Computer or compatible microcomputer and does not require user programming. It emulates an IBM 3274 Model 51C or 61C cluster controller and supports up to 16 concurrent sessions. It also provides synchronous host communications at up to 9.6K bit/sec., the vendor said.

The board consists of a National Semiconductor Corp. NS32016 CPU chip and 512K bytes of memory. It costs $1,495 and is available immediately.

NAS, 800 E. Middlefield Road, Mountain View, Calif. 94040.

AUXILIARY EQUIPMENT

■ **LP COM has introduced a portable Telecommunications Test Computer that runs under Microsoft Corp.'s MS-DOS operating system.**

The Model TC-2000 contains built-in self-diagnostics and an administration software package that includes a calculator, calendar and notepad. Systems are configured according to the user's needs for digital, analog or both testing functions.

A basic TC-2000 with Transmission Impairment Measurements (Tims) test instrument software and a Signaling/Supervision package for full signaling and testing capability — for analog testing — costs approximately $18,000.

A basic TC-2000 with the Protocol package for monitoring, trapping, emulation and analysis capabilities in a digital environment costs approximately $14,000. A fully loaded system with all capabilities costs approximately $27,000, the vendor said.

LP COM, 21020 Homestead Road, Cupertino, Calif. 95014.

■ **Dynapert, a division of Emhart Corp., has announced its UCCS 9000 Data Supervisory Management (DSM) system that controls and manages Dynapert printed-circuit board insertion equipment.**

The Dynapert UCCS 9000 DSM system features a central data base that develops, edits, transfers and stores printed-circuit board programs for up to 20 axial, dual in-line package and odd-form insertion equipment (machines that automatically assemble printed-circuit boards), the vendor said. It polls each insertion machine hourly for information such as how many components were inserted or misinserted, time of operations and so on, which can later be extracted for management reports, the vendor said.

The system has 256K bytes of random-access memory, dual floppy disk drives and a monochrome terminal for $21,000. Options include a color terminal and printer interface.

Dynapert, Suite 105, 148 Linden St., Wellesley, Mass. 02181.

"Nobody remembered its birthday."

```
E--TSO
EDIT ---- K903220.XSPF1.OUTLIST
COMMAND ===>
000025            // PARM=('SSA
000026            //  PGM=SOBFP
000027   6        //STEPLIB  DD
000028   7        //         DD
000029   8        //DFHLIB   DD
000030   9        //CHKDD    DD
000031  10        //CHKDD2   DD
000032  11        //PARMS    DD
000033            //   SPACE=(C
000034            //   DCB=(REC
000035  12        //VMFILEA DD
000036            //   SPACE=(C
000037            //   DCB=(REC
000038  13        //SYSOUT   DD
000039  14        //SYSPRINT DD
000040  15        //SYSDBOUT DD
000041  16        //OUTPUT   DD
000042  17        //INPUT    DD
000043  18        //STEP2  EXEC

E7
```

```
C--PC2
  TDISK    EXEC    A1    V 130    TRUNC=130 SIZ
      |...+....1....+....2....+....3....+....4
00018 CP DEFINE &KIND &VADDR &CYL
00019 &IF &RETCODE EQ 91 &GOTO -FAILED
00020 -CONT
00021 &TYPE OBTAINED &CYL CYL.S OF &KIND DASD
00022 &STACK HT
00023 &STACK LIFO TDISK
00024 &STACK LIFO YES
00025 FORMAT &VADDR &MODE
00026 &RC = &RETCODE
00027 &STACK RT
00028 &MODE = &CONCAT &MODE 1
00029 * WRITE A DUMMY FILE TO BE TESTED BY SCO
00030 &IF &RC EQ 0 EXSERV WRITE TDISK ACCESSED
00031 *
00032 &IF &RC EQ 0 &TYPE &DASD (&VADDR &MODE)
00033 &EXIT &RC
00034 -FAILED
00035 &TYPE ... UNABLE TO GET &CYL CYL TDISK &
00036 &EXIT 91
===>
                          C7
```

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STC

from page 75

models. The field-upgrade feature gives STC a marketing edge over IBM, but the long delivery schedule for the 8380E and STC's already shaken reputation — as a result of its filing for Chapter 11 under the Federal Bankruptcy Act last October — seem to mar its attempts to make a strong comeback against IBM.

Why it is taking STC so long to bring the 8380E to the market is a puzzling and perhaps critical issue for STC. Ryal R. Poppa, chairman and chief executive officer of STC, said the company wants to make sure the 8380E is reliable. Even though STC is claiming it has already installed 2,000 of the 8380E units, Poppa claimed that to ensure reliability, the company wants to complete quality testing.

> ”
>
> *'Mostly, [the 8380E announcement] helps convince customers that Storage Technology is not going away.'*
>
> **— Michael Geran**
> **E. F. Hutton & Co.**

Since the 8380E is the first product STC has announced since its Chapter 11 filing, embarrassing technical problems with the unit would indeed be devastating. In that sense, Poppa's concern for quality is absolutely justified. But the noble quest for quality seems to pale when viewed in the context that IBM will be making volume shipments of its double-capacity 3380 for a year before STC can gear up volume shipments of its 8380E.

"Mostly, [the 8380E announcement] helps convince customers that Storage Technology is not going away," said Michael Geran, an analyst with E. F. Hutton & Co. in New York. It also gives customers a reason to go ahead and buy a single-capacity 8380 drive, he added.

"It looks like [it has] the technology to do it," Geran said of STC's attempted comeback. "But will the window be open long enough? The fourth quarter of 1986 is a long ways away."

The field upgradability of the 8380E could keep the 8380s moving out the door, said Robert H. Katzive, vice-president of Disk/Trend, Inc. a Los Altos, Calif., market research firm.

"IBM has a little problem there," since until recently the 3380 drives it was shipping were not upgradable to double-capacity machines, Katzive said.

But IBM has already shipped an impressive number, about 3,000 units, of the single-capacity 3380s that can be upgraded to double-capacity models. At that rate, one analyst estimated, IBM could ship 45,000 spindles, or 20,000 units, of the upgradable single-capacity models by the year's end, when the double-capacity upgrades become available.

In 1983, STC had 20% of the market for large-scale, 500M-byte drives, according to Disk/Trend's last published figures. That share has dropped in the face of the Chapter 11 filing, Katzive said.

Orders 'below expectations'

Poppa admitted orders for the 8380 were below expectations in the first quarter. If the pace does not pick up during the rest of the year, the Louisville, Colo., firm would realize about 60% of its anticipated $700 million in annual revenues, he said.

Poppa noted, however, that STC has cut its work force from 16,000 to 10,000, and its service revenues have continued to grow through the Chapter 11 proceedings. It only needs 8% to 9% of the large disk drive market for the company to be profitable, he said.

STC also announced an upgraded 8890 cache disk controller, which can be field-upgraded to contain up to 72M bytes of cache memory. The previous version contained 18M bytes. The upgrade is made possible by substituting 256K dynamic randon-access memory chips for 64K-byte chips, according to STC.

Poppa also vowed that STC's optical disk project, although severely cut back earlier this year, is not dead. A team of 40 employees continues to work on the optical disk drive that is supposed to be compatible with IBM 3380 systems. An announcement on the product will come in 1986, Poppa said.

STC claimed to be working on its own version of the IBM 3480 tape drive, with an announcement to come later this year, he said.

The double-capacity 8380E costs $108,200, an STC spokesman said. The field upgrade of the single-capacity to double-capacity drive will cost $45,000, bringing a $63,150 single-capacity 8380 into line with the cost of the double-capacity unit, spokesmen said.

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DRIVES

from page 75

However, each company's dual-capacity 3380 alternative is disappointing, which raises the question of whether either firm has a long-term future in the IBM-compatible peripheral business.

STC's approach, a field-upgradable, double-capacity version of its 8380 disk drive, called the 8380E (see story page 75), mirrors IBM's approach to the dual-capacity 3380. But delivering the 8380E a year after IBM begins making volume shipments of its dual-capacity models is like hauling water to a fire in a leaky bucket. STC is already way behind IBM in single-capacity 3380 shipments. If it holds firm on the fourth-quarter 8380E shipments, it will probably fall further behind.

Memorex managed to match IBM's proposed fourth-quarter 1985 delivery date for the dual-capacity 3380 but with a far different disk drive. Memorex's 3680 HDP is a repackaged version of its 3680, which has eight head disk assemblies packed into one box.

Unable to announce product in time

The approach is clearly a novel idea that has some merit, but whether it will lure users away from buying the double-capacity 3380 is another question. Memorex is still promising a double-capacity 3380-type product soon, but it is clear the company is simply not able to announce such a product in time to compete seriously with IBM's slated fourth-quarter deliveries.

However, it's the promises from STC and Memorex that are most intriguing — and most disappointing. Both companies built their businesses on being able to deliver IBM-compatible peripherals sooner — and at more attractive prices — than IBM. Now the opposite appears to be the case. STC and Memorex still offer a price advantage, but IBM now has the strong upper hand on delivery.

STC cannot deliver its a dual-capacity 8380E until late 1986, and Memorex hasn't even announced a dual-capacity 3680 yet. Meanwhile, IBM appears to be gearing up for massive shipments of its dual-capacity 3380 in the fourth quarter of 1985 and early 1986, a move that could leave Memorex and STC in the dust.

STC's and Memorex's promises don't end with the dual-capacity 3380 either. It has been better than a year since IBM took the wraps off its 3480 tape drive, and so far neither Memorex nor STC has been able to match the IBM announcement. Both companies made it clear at recent press conferences that 3480-compatible products would be forthcoming, but neither company could be very specific about when such products would arrive.

Memorex beefed up its support for the IBM 3420 marketplace with a tape caching subsystem and some additional tape control units, claiming there are many users who do not want to switch immediately from the 10½-in. reel-to-reel 3420 format for the cartridge tape format used in the 3480. The company is wise to offer additional products to the 3420 marketplace, but the 3420 market is dying and will eventually become extinct. Granted, the end of the 3420 market will not come tomorrow, but if Memorex is betting on long-term profits from 3420s, it is in for a surprise.

Vows to build new products are certainly noble. But when users need solutions to tangible business needs, promises are of little help. Nor do promises do much for corporate bank accounts. Significant layoffs at both Memorex and STC are clear indications of that.

Already suffering from sagging sales as a result of stiffer IBM competition, neither Memorex nor STC is going to improve its current lot with promises while IBM ships truckloads of real products. Many people sincerely hope both Memorex and STC can turn current adversity into renewed success. But it just won't happen without real products. And unless IBM makes an enormous mistake that opens up a big window of opportunity for Memorex and STC, the future of both companies looks grim.

NCR

from page 75

a floppy disk drive capable of storing up to 1M byte of memory, eight RS-232C I/O ports and basic Unix software. For an additional $755, users can purchase a Unix Extension Module, a collection of programs said to offer users more flexibility in configuring small disk-based systems. Modules include extra utilities, graphics software, documentation, software development, system accounting and communications software, NCR said. The Minitower will be available this month.

NCR is located at 1700 S. Patterson Blvd., Dayton, Ohio 45479.

WANG

from page 75

boards and can communicate with existing 2200 option boards and peripherals, the vendor said. Both machines support up to 13 users.

Both systems come with 32K bytes of control memory and can be ordered with either 128K bytes or 512K bytes of user memory. Four packaged configurations are available for either system.

Release 2.6 of the Basic-2 multiuser operating system that is required for the systems just announced is also available for all currently installed 2200 systems. This release features a generalized printer driver that allows 2200 CPUs to use the Wang Professional Computer Model PC-PM010 and PC-PM016 printers, the vendor said.

More information can be obtained from Wang, One Industrial Ave., Lowell, Mass. 01851.

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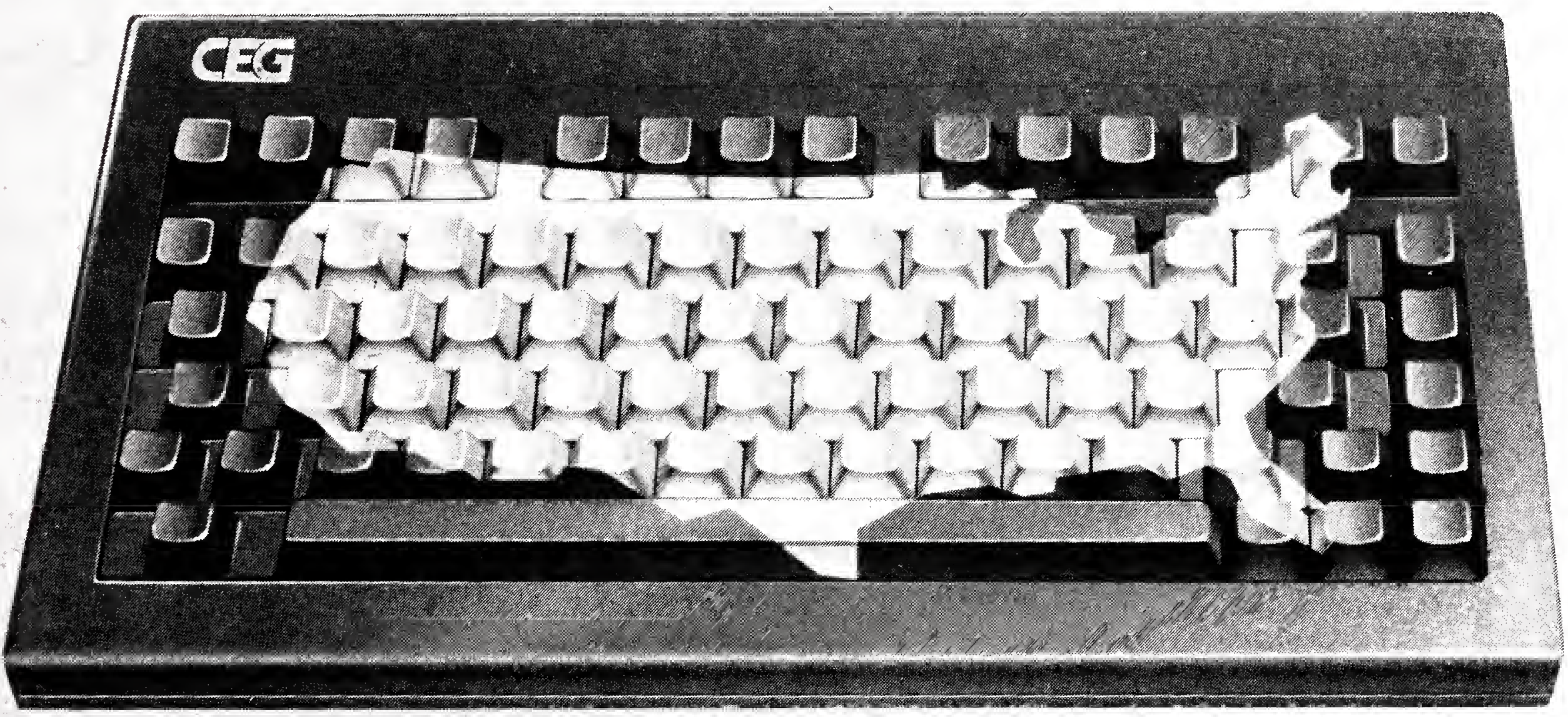

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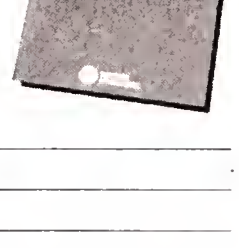

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COMPUTER INDUSTRY

Sterling launches proxy fight

By Kathleen Burton
CW West Coast Bureau

DALLAS — Spurned by the board of directors of Informatics General Corp., Sterling Software, Inc.'s cash buy-out offer will be placed before Informatics shareholders at that company's annual meeting May 9, Sterling declared.

Sterling, which first offered $25 per share and later upped the offer to $26 per share, said it will seek election of two pro-takeover directors and defeat of an antitakeover provision scheduled for vote at the Informatics meeting.

After its second offer was rejected by the Informatics board, Sterling declared in a statement, "It now appears that we have no choice but to proceed with a proxy solicitation to defeat the antitakeover proposal and elect two Sterling nominees to the Informatics board who will be committed to produce a merger with Sterling, which we believe is in the best interest of all stockholders."

Sterling, based here, placed advertisements in newspapers asking Informatics shareholders to sign new proxies in opposition of the antitakeover vote and in favor of the election of Samuel Wyly and Sterling L. Williams to the Informatics board. Wyly is chairman and Williams is president and chief executive officer of Sterling.

Informatics declined to comment on the latest round in the takeover attempt. Sterling had acquired 9.3% of Informatics stock on the open market prior to making its first cash offer. The bulk of Informatics shares are held by institutional investors.

In an earlier statement, Walter Bauer, chairman and president of Informatics, said the company's board rejected the original offer because it was "not in the best

See **TAKEOVER** page 99

Exec says U.S. will act to curb imports of Japanese products

By Clinton Wilder
CW Staff

WELLESLEY, Mass. — Japanese markets will remain cool to American high-technology products, and the U.S. government will institute its own protectionist trade measures, according to National Semiconductor Corp. Chairman Peter J. Sprague.

Sprague called the current semiconductor industry slump "dreadful" but predicted recovery later this year based on rejuvenated demand from computer and electronics manufacturers.

Sprague was interviewed here recently at his induction into Babson College's Academy of Distinguished Entrepreneurs. He was honored along with Australian publishing magnate Rupert Murdoch and People Express Airlines, Inc. founder Donald Calvin Burr.

Regarding current trade tensions, Sprague said Japanese promises to open trade doors are mere lip service. "It's all nonsense. Even if they removed the official barriers, it wouldn't make much difference anyway. I tried to open a consumer electronics store in downtown Tokyo, and it took a year and a half just to rent the space and set up.

CW PHOTO BY CLINTON WILDER

Sprague, left, and Murdoch

"It's just a very restrictive country. Remember, we're talking about a place that in 1975, under full world pressure, decided to allow all of 114 Vietnamese refugees into the country."

Sprague predicted the U.S. will eventually respond with trade restrictions of its own. Such restrictions could include surcharges that would apply to National Semiconductor's National Advanced Systems Corp. (NAS) mainframes made by Hitachi Ltd. in Japan, he said.

"Protectionism will happen here," Sprague said. "And if it's an across-the-

See **CURB** page 98

- Vendor representatives remain cool to a key ring antipiracy device at an Adapso conference/**87**
- Although most of the industry has not yet realized it, IBM has embarked on another radical shift in direction/**90**
- Victor Technologies has sued Tandy for a Radio Shack ad that calls a Victor product an "orphaned" computer/**96**

Adapso calls tax bills costly

By Kathleen Burton
CW West Coast Bureau

SAN FRANCISCO — Federal tax reform proposals coming up before the U.S. Congress this year could cost computer companies millions in tax dollars if enacted, according to I. Sigmund Mosley, vice-president of Management Science America, Inc.

During a meeting on federal tax issues at the Association of Data Processing Service Organizations, Inc. (Adapso) conference held here recently, Mosley said three tax reform proposals now before Congress could seriously affect the computer industry: the U.S. Department of the Treasury proposal, a second draft of which is scheduled for release May 15; a plan proposed by Rep. Jack Kemp (R-N.Y.) and Sen. Robert Kasten Jr. (R-Wis.); and a proposal by Sen. Bill Bradley (D-N.J.) and Rep. Richard Gephardt (D-Mo.).

Although some proponents claim the tax reform proposals would benefit high-tech companies more than traditional manufacturing companies — they would lower historically high tax rates incurred by

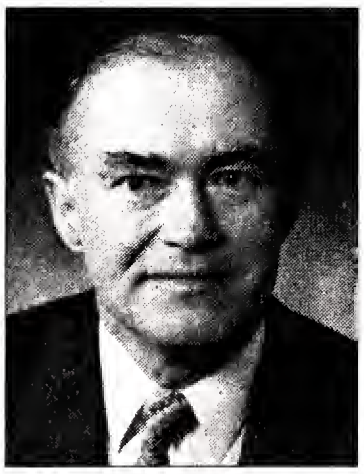
See **TAX** page 96

Chief says DG will focus on OA mart

By Clinton Wilder
CW Staff

BOSTON — Despite its recent profit slump, Data General Corp. is confident it can shift focus from its traditional industrial and scientific computer applications markets to office automation, DG Chairman Edson D. de Castro told a recent meeting of security analysts here.

De Castro said the company's second-quarter slump was most acute in sales to industrial, scientific and OEM customers [CW, April 29]. He also noted that sales of the Data General/One laptop micros were still "below expectations" but that DG Desktop Generation micros and other OA products continue to sell well.


De Castro

The Westboro, Mass.-based minicomputer maker reported earnings of $9.1 million in the quarter ended March 30, down from $14.2 million reported in the previous year. Per-share earnings slipped from 55 cents to 34 cents.

Explaining the quarterly results, de Castro cited weak orders from domestic customers, a marked drop in demand for DG's 16-bit Eclipse minis from OEMs and sluggish industrial markets due to the falloff in capital spending.

"We are down in our traditional strength of sales of 16-bit products to OEMs for medical, technical and [computer-aided design and engineering] applications," de Castro said. "Those markets are moving to 32-bit systems, but the transition has been slow to occur, especially among electronics and semiconductor manufacturers."

De Castro predicted that the company's next significant growth area will be large-volume sales of high-end 32-bit OA products and integrated personal computers to both the private and public sectors.

"The office integration market is only beginning, and we have found our business mix shifting more rapidly to business automation," he said.

"In sales to the federal government, the OEM is becoming less dominant as the need for integration

See **DG** page 99

Computervision loss exceeds projections

BEDFORD, Mass. — Computervision Corp. last week announced a first-quarter loss of $18.8 million, or 65 cents per share, somewhat more than earlier projected.

The company announced last month [CW, April 15] the dismissal of 15% of its work force, some 950 employees, after projecting a first-quarter loss as high as $15.7 million. The actual loss was higher due primarily to one-time costs of reducing operating expenses, the company said.

The loss compares with year-earlier profits of $16.2 million, or 37 cents per share. Revenue for the quarter was $105.8 million, down 13% from year-earlier revenue of $121.7 million.

Despite the financial setback, which followed fiscal year 1984 profits of $47.7 million on revenue of $556.3 million, James R. Berrett, the company's president and chief executive officer, said, "the company continues to maintain a strong balance sheet."

Computervision said the adverse results were due to a sluggish economy, operating expenses based on higher than achieved revenue and a stretch-out in the sales cycle due to the transition of the company's product line.

Nixdorf exec blasts German PTT for impeding progress

By Susan Blakeney
CW Staff

HANNOVER, West Germany — In a fiery opening day address at the recent Hannover Faire here, Nixdorf Computer AG's founder and president, Heinz Nixdorf, charged the West German Postal Telephone and Telegraph (PTT) authority with obstructing technological progress in the country.

According to this patriarch of the Paderborn, West Germany-based computer firm, the German PTT is grossly inefficient, expensive and anachronistic. Nixdorf claimed the state-run monopoly "would certainly change their structure if they thought it would make them rich."

Nixdorf's attack on the domestic PTT included the charge that the groundwork for an integrated services digital network system here will not be ready by the year 2000.

Nixdorf also hurled criticism at the government in general. "Germany is the strongest European country economically but at the same time the weakest nation. Germany just does not spend enough money educating its youth," he said. Furthermore, Germany's national birth rate is on the decline, heralding more bad news for the future national work force, Nixdorf predicted.

Nixdorf dealt harshly with his competition as well, arguing the superiority of his company's product line. "We've invested in order to produce quality. You cannot count on the same from the world's largest computer company," he said, alluding to IBM.

He noted that the U.S. Department of Defense invests huge sums of money in the electronics industry, which ultimately benefits private industry. German firms, on the other hand, are largely left on their own to finance their efforts, he said.

Nixdorf listed Japan, in addition to the Pentagon, among the enemies of the German high-tech economy. "The Japanese have been able to bring exceptional and inexpensive products to the market because of their low wage scale . . . a scale that would be considered unacceptable in Germany."

As for product strategy, "the future of Nixdorf AG lies in communications technology," Nixdorf said. He noted that the business of integrating data processing and data transmission accounted for 5% of the company's worldwide revenue of $1.09 billion in 1984 and predicted it will increase to 10% this year.

But the most important contribution of the computer company is the jobs it provides. Approximately 250 workers per month were added to the Nixdorf work force in 1984, and the company has shown continued growth so far. Nixdorf projected that corporate revenue will double that of 1984 in less than four years.

Lotus to buy Dataspeed for $6.5 million

CAMBRIDGE, Mass. — Lotus Development Corp. recently announced it had agreed to acquire San Mateo, Calif.-based Dataspeed, Inc. in a transaction valued at $6.5 million.

Lotus also recently announced first-quarter profits of $9.6 million, or 58 cents per share, up from $7.5 million, or 47 cents per share, a year earlier. Revenue for the quarter was $44.7 million, up from $28.2 million a year earlier, but below the levels of the previous two quarters.

Dataspeed manufactures two products that receive data transmissions from FM sideband radio waves and provide users with real-time stock quotations. The Quotrek product is a hand-held device that resembles a pocket calculator and displays information on a small screen. The Modio is a modem-like device that attaches to a micro and will reportedly be bridged to Lotus' 1-2-3 and Symphony software products.

The letter of intent, signed by the two companies, provides for a cash acquisition reflecting $2.05 for each Dataspeed share before accommodating a pro rata reduction of certain shareholder expenses associated with the acquisition.

Additionally, the agreement provides for conversion of about $3.7 million of Dataspeed's long-term debt to be converted into common stock at a conversion price of $5 per share. Also, Lotus will acquire about $300,000 of the long-term debt for approximately $122,000, and all interest on Dataspeed's debt will be forgiven, according to Lotus.

Dataspeed's current cash needs will be met by loans from Lotus to provide working capital until the acquisition is formally completed, which is expected to occur within three months, the companies said.

Following approval of the boards of directors of both companies and the shareholders of Dataspeed, the acquired company will operate under the Dataspeed name as a wholly owned subsidiary of Lotus. Dataspeed's chairman, David B. Lockton, and president and chief operating officer, James West, will continue to manage the company.

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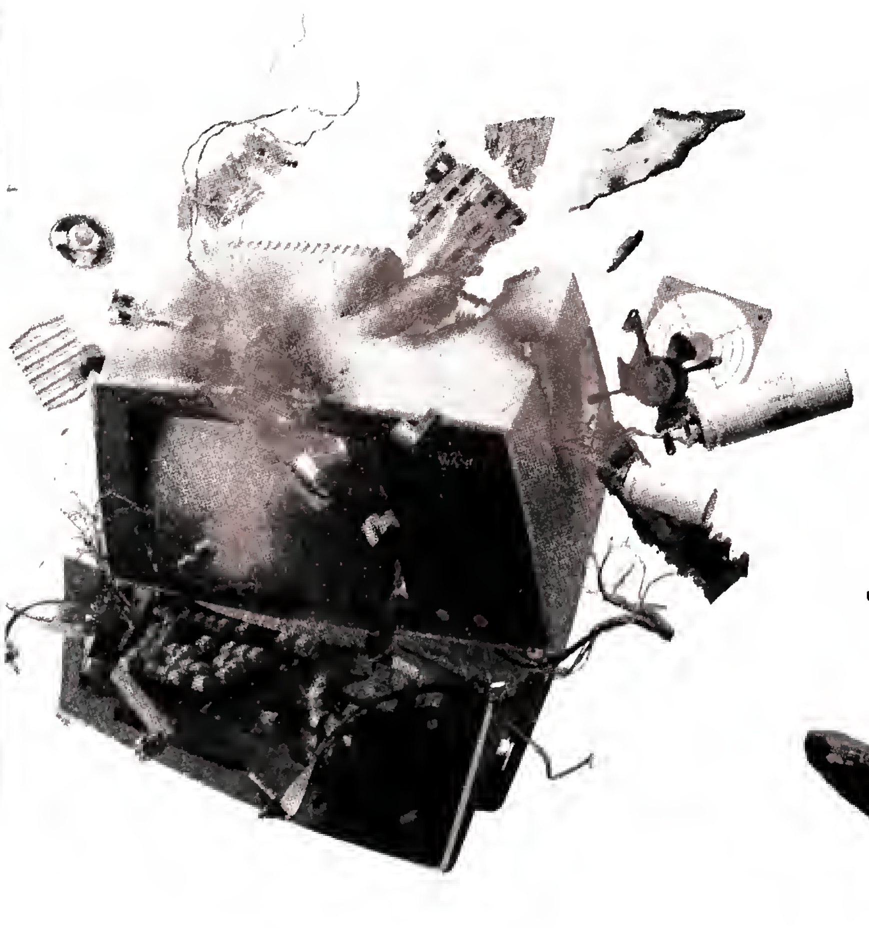

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Adapso group reviews key ring standard proposals

By Kathleen Burton
CW West Coast Bureau

SAN FRANCISCO — Hardware and software vendor representatives who met here recently to review proposed standards for devices to prevent software piracy said several key issues remain unresolved.

Sponsored by the Association of Data Processing Service Organizations, Inc.'s (Adapso) Software Protection Committee, the meeting was held to discuss the committee's controversial standards proposal regarding development of a key ring hardware component intended to prevent microcomputer software piracy.

Marvin Goldschmidt, chairman of the Adapso committee and vice-chairman of Lotus Development Corp., said he was disappointed that no user groups — including the New York-based Microcomputer Managers Association, which opposes Adapso's copy-protection proposals — attended the meeting.

Problems exist

Several technical problems still stand in the way of the standard, which Adapso members said would be finalized within two months.

The prototype key ring products presented at the meeting by Quadram Corp. of Norcross, Ga., were too large, said Barton O'Brien, sales vice-president at RSA Security, Inc. in Sunnyvale, Calif.

"At this rate, the device will be bigger than the computer it's supposed to protect," O'Brien said. But RSA plans to manufacture such a key device that will act as an "electronic passport," verifying identification and credit and banking data, he said.

Ramesh Bijor, engineering manager for Racal-Vadic, Inc. in Milpitas, Calif., a manufacturer of modems and add-on cards, said he was skeptical of the prototypes he had seen at the presentation. Bijor said that speed and transparency to the end user were still unresolved issues.

"Quadram says its device will operate at 38.4K bit/sec.," he said, "but I'd believe it more if it ran at 2.4K bit/sec." Bijor said Racal-Vadic was planning to differentiate a key ring product by making it part of a modem.

Simcha Lerner, principal Lotus software engineer, said some computer systems, such as Apple Computer, Inc.'s Apple II, have noncommunicative status lines that prevent host-to-key-ring communications.

William A. Miller, vice-president for product development at Practical Innovations, Inc., a Sunnyvale, Calif.-based integrated circuit designer, said, "To meet the standard, we need to know more about it. What we really want to know is, can we do it cheaply, and will someone buy it."

Providing 100% security

Several participants questioned the viability of a hardware-based device, saying that nothing can provide 100% security. Skeptics said the device would require software to read the key, and software is always open to pilferage by motivated hackers or engineers.

But Paul Maybaum, a Hewlett-Packard Co. engineer, said, "There's a lot of paranoia about this, but just because a device can be defeated doesn't mean it's no good."

The key ring would make it technically and financially unfeasible for most users to defeat it, Maybaum said, because "very few people have a $10,000 logic analyzer on their desks."

Comdisco posts second-quarter profit increase

ROSEMONT, Ill. — Comdisco, Inc., a computer dealer and leasing company based here, recently announced second-quarter operating profits of $8.1 million, or 30 cents per share, up from $4 million, or 14 cents per share, in the same period a year earlier.

Revenue for the quarter was $138 million, down from $146.7 million a year earlier, according to the computer firm.

The company said computer sales revenue declined by about $25 million from that of a year earlier, owing primarily to a purchase slowdown resulting from anticipation of IBM's recently announced 3090 series mainframes.

Extraordinary gain

Comdisco also posted an extraordinary gain of $30.1 million, or 30 cents per share, realized through an exchange of new debentures for existing debentures.

Comdisco Chairman and President Kenneth N. Pontikes said, "IBM's recent product announcements have reduced uncertainty in the marketplace and will provide substantial future opportunities for Comdisco as deliveries begin and as existing systems are displaced."

The company said that, other than the computer sales decline, revenue from all of its other activities was higher than that of the year-earlier period.

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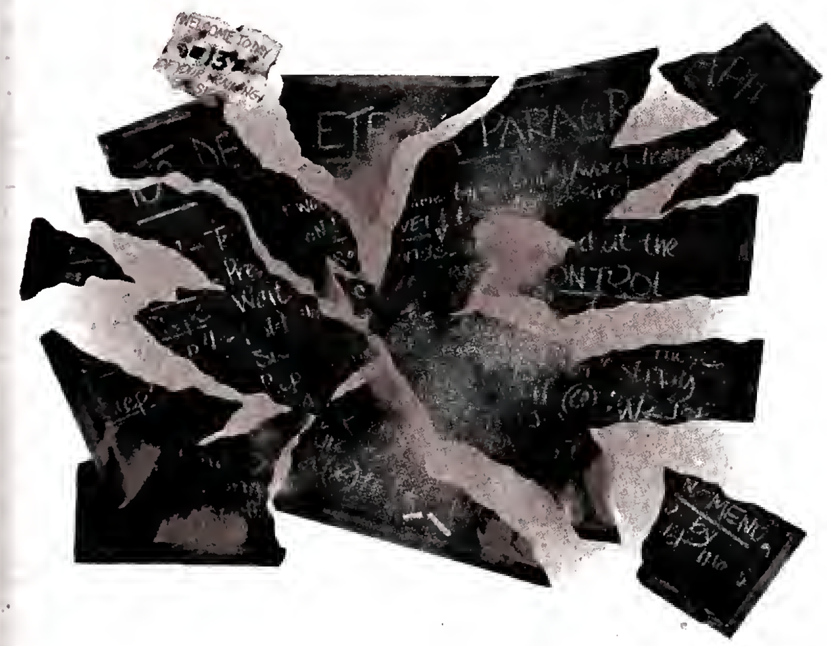

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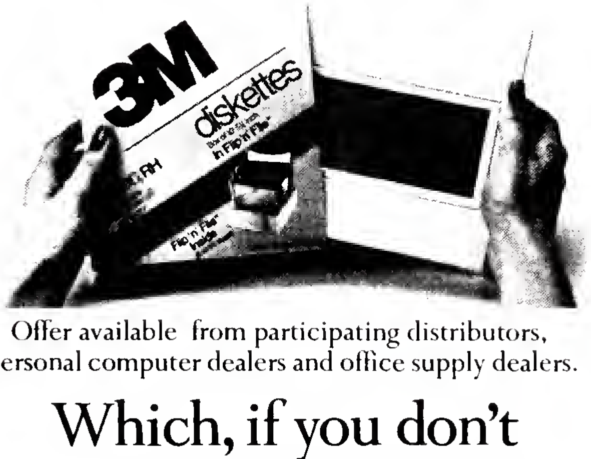

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IBM must make changes to retain its 'colossus' status

OUTSIDE LINES
Brian Jeffery

First of a two part series.

The trouble with IBM is that as soon as everyone has figured out how it works, it starts working differently.

In the 1970s, IBM was considered something of a monolith, preoccupied with its mainframes and none too agile in addressing other markets. Then in 1981 it reorganized, new strategies were introduced, diversification programs launched and a new "entrepreneurial" spirit manifested.

The success of IBM in the microcomputer marketplace was lauded as an indication of a new, flexible, fast-moving IBM. In 1983, *Time* ran a cover story about the company — "IBM: The Colossus That Works" — and IBM basked in an almost universally favorable response from the press, industry analysts and the financial community.

IBM announced that it was shooting for 15% annual revenue growth for the next decade and seemed to be making it. In 1983 it logged 16.9% revenue growth. That same year, IBM appointed a relatively young company veteran, John Akers, as president.

It is 1985, and a lot has changed. Although most of the industry has not yet realized it, IBM has embarked on another of its radical shifts in direction. By the time it is over, it will likely have an impact on the information processing industry equal to that of the 1981 reorganization.

The most visible change has been in IBM's microcomputer operations, once the showpiece of the "new IBM." IBM's Entry Systems Division has been cut back to the status of just another IBM product division, with its marketing operations turned over to a mainstream IBM division and its charismatic head, Phillip D. Estridge, removed from the scene. The PCjr is dead, and the breakneck 1984 growth in sales of Personal Computers has given way to what, by IBM's own admission, is going to be a much weaker 1985 market.

> "
>
> *Although most of the industry has not yet realized it, IBM has embarked on another of its radical shifts in direction.*

While opinions differ on the significance of IBM's treatment of its Personal Computer operations, there is general agreement that there will be more central control of Personal Computers and closer integration with other IBM products and strategies.

The tone of IBM corporate management has also changed. In 1983, then IBM Chairman and Chief Executive Officer John Opel was emphasizing "new entrepreneurial opportunities with high, long-term growth potential." Opening 1985, IBM CEO and President John Akers gave an interview to *Business Week* in which he talked about IBM's Systems Network Architecture (SNA) and increasing IBM software revenue.

While all this was going on, yet another major change was occurring, one that was clearly not in the company's plans. IBM's financial performance took a nosedive. After its 1983 peak, IBM's revenue growth hovered a little above 15% for the first three quarters of 1985, then dropped to 12.4% in the fourth quarter. In the first quarter of 1985, things went from bad to worse. Revenue growth was down to a startling 1.9%, and earnings dropped no less than 17.9%. IBM blamed the slump primarily on the exchange rate.

The exchange rate didn't help, but the fact is that John Akers had taken over management of a company that had some serious problems, and the decisions being taken under his regime were attempts to deal with a fast-deteriorating situation.

What went wrong? Among other things were the following:

■ IBM had given itself a major short-term growth stimulus by converting from a rental to a sales company, substituting larger up-front billings for the slower, more stable revenue streams from rental equipment. Rental income declined from 44% of IBM revenue in 1979 to 37.3% in 1981 and 14.3% in 1984 and seems to be disappearing in 1985.

The problem is that IBM has now pretty well exhausted the growth potential from this conversion process. In retrospect, IBM had converted too fast, giving it several years of fast growth but creating a serious growth drag over 1984-85 as the stimulus slowed.

■ Despite the widespread perception of IBM as the "Colossus That Works," IBM over 1981-84 had been a company of highly variable performance.

A couple of "star" performers, principally mainframes and Personal Computers, had disguised weaker showings elsewhere. The mid-range sector has remained weak; virtually all of IBM's Independent Business Units turned in woeful performances; maintenance services, which have accounted for more than 11% of IBM revenue for several years now, remained a high overhead operation that had to strain to match corporate growth; IBM's move into the telecommunications area ran into technical bugs, problems with collaborators and losses; the company's massive investments in R&D and manufacturing plant and equipment did not pay off as expected.

As a result, IBM became highly dependent on its "star" performers. They were carrying much of the rest of the company. In 1984, IBM recorded record sales of its 3080 line of mainframes and related products, and its Personal Computers. Slumping 3080 and Personal Computer sales this year have had a "multiplier effect" in bringing down overall corporate performance, and the slowdown in IBM's revenue growth from these areas looks like a long-term phenomenon.

■ John Opel's decentralized management style has resulted in IBM's failing to address many structural problems. For example, the profusion of Personal Computers in the corporate market has undercut IBM's efforts to develop a more comprehensive office automation scenario built around SNA.

The decentralized management style also meant that IBM failed to address the inefficiencies and losses of its Independent Business Units, the National Marketing Division small business direct sales organization and the disastrous Product Center program and other areas. Similarly, although IBM had been drawing plaudits for its heavy R&D and manufacturing investments, there is reason to doubt their effectiveness. IBM's in-house R&D activities have contributed only a few really new products and technologies, and throwing robots at its work force has disguised the fact that IBM remains overstaffed on the manufacturing side. In both cases, IBM's response has been to throw money at problems rather than to perform the kind of surgery that could have made these areas more cost-effective.

Next week: What the changes are likely to involve.

Jeffery is director of research at International Technology Group, a Palo Alto, Calif.-based computer industry market research firm that focuses on IBM.

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Former IBM exec joins Amdahl

SUNNYVALE, Calif. — Amdahl Corp. has named former IBM Corporate Marketing Director E. Joseph Zemke chief operating officer, effective May 1.

Zemke most recently was president and chief executive officer of Auto-Trol Technology Corp. in Denver. Before joining Auto-Trol, he was employed by IBM for 18 years as a systems engineer, regional manager and corporate director of marketing.

Zemke will be part of Amdahl's newly formed office of the president. He will report to Amdahl Chief Executive Officer John C. Lewis.

Zemke will be responsible for direct management of the day-to-day functions of the mainframe and storage product manufacturer.

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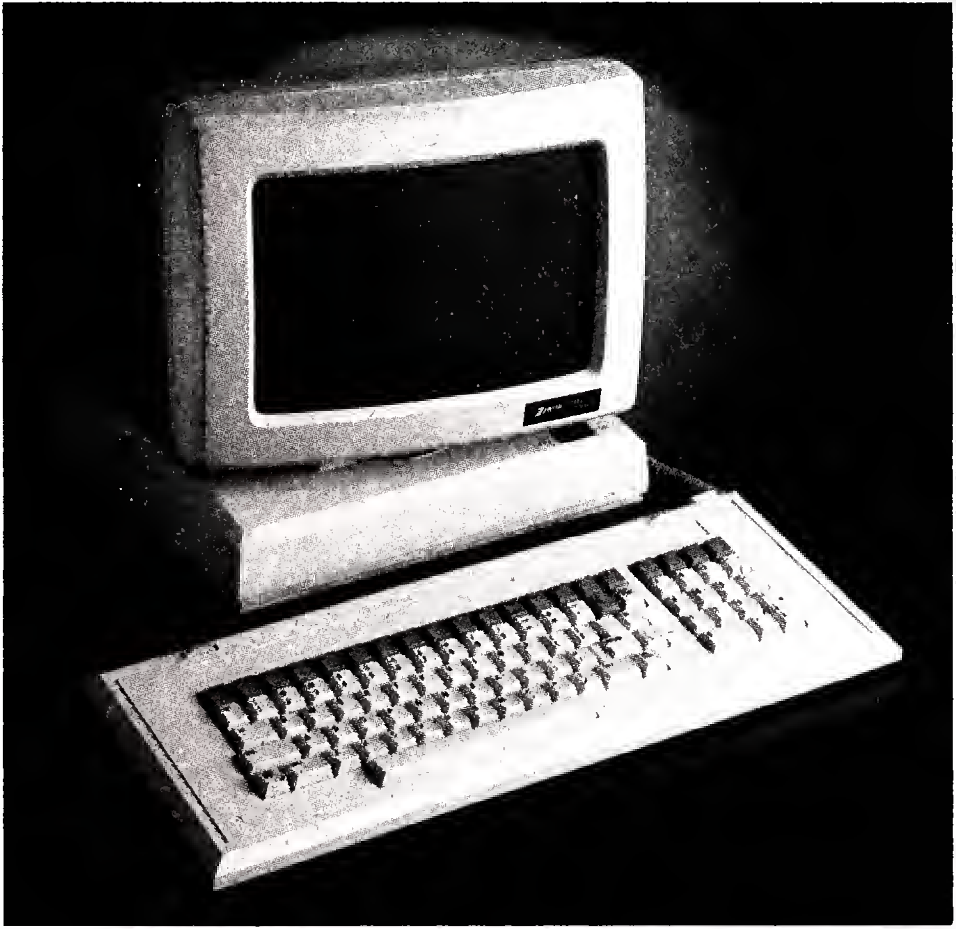

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Tandy advertisement prompts Victor suit

SAN FRANCISCO — Victor Technologies, Inc. has filed suit against the Radio Shack division of Tandy Corp. because of a Tandy newspaper advertisement that encouraged users of Victor and other personal computers to "throw your orphaned computer on the junk pile."

A spokesman for Victor, which is currently protected from its creditors under Chapter 11 of the Federal Bankruptcy Act, called the ad "really pretty sickening. It was particularly unfair since we've never abandoned any of our products, and we have continued to manufacture and support the 9000 [mentioned in the ad]," spokesman Michael Penna said.

The suit, filed April 23 in U.S. District Court here, seeks $1 million in punitive damages and unspecified amounts in special damages and in general damages for loss of reputation. The suit demands compensation for any sales Victor can prove to have lost because of the ad and an account of any profits Tandy may have made promoting its products at the alleged expense of Victor.

The ad, which ran Feb. 22 in *The Wall Street Journal* and other publications, offered owners of Victor and other micros a $75 to $150 credit toward either a Tandy or a Radio Shack personal computer. "Radio Shack wants to give your orphaned computer a new home — the junk pile," the ad read.

Victor attorney Constance Jones said that Victor did receive a requested letter of apology from Tandy but that Tandy refused to publish a retraction of the ad as demanded by Victor. Jones said Tandy's letter "apologized for any offense that Victor had taken," but did not disclaim the description of the Victor computer as "orphaned."

Tandy legal department spokesman Herschel Wynn could not be reached for comment.

No other vendors mentioned in the ad have filed suit against Tandy, but Penna said Victor's action may encourage them to do so if they feel that their reputations have been damaged.

TAX

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noncapital-intensive companies such as software developers — Mosley said computer service and software companies have simply qualified for fewer tax credits and incentives in the past, and, therefore, fewer tax dollars would be taken away from them under the new proposals.

Mosley said Adapso plans to study each of the tax proposals to determine whether they create adequate incentives for research and development and capital formation. Adapso's board will support tax reform only if sufficient incentives are identified, he said.

Tax credit up for review

Also slated for congressional review is the Research and Development Tax Credit, which provides a 25% credit for increasing a company's qualified research expenditures over a specified time period, said Mary Jane Desrosiers, Adapso's assistant general counsel, who cochaired the meeting with Mosley.

In 1983, the IRS attempted to redefine what constitutes qualified research, making computer software ineligible for the credit, Desrosiers said.

The IRS' proposed regulations were never finalized, Desrosiers said, but because the credit will expire Dec. 31, Adapso members will lobby for the passage of two bills now before Congress.

The bills (S. 58 and H.R. 1188), introduced by Sen. John Danforth (R-Mo.) and Rep. J. J. Pickle (D-Texas), respectively, would make the R&D tax credit permanent.

These bills would also redefine qualified research to include R&D specifically aimed at the development of software for business use, Desrosiers said.

No hearings have been scheduled for the bills yet, she said. However, Adapso is collecting financial data from computer and other high-technology firms that will be used to support Adapso's claim that the credit is effective in stimulating increased R&D, she said.

'Private Letter' ruling

Another ruling slated for congressional review is the "Private Letter" ruling, issued by the IRS last fall. The ruling exposed most software companies to a personal holding company tax that could cost them a 50% tax on all retained earnings.

"The IRS ruling, in effect, lumps software companies under the personal holding company tax umbrella," Desrosiers said.

Under rules governing taxation of personal holding companies, software license and maintenance fees constitute "passive" income, and if 50% of a software company's income is derived from passive investments, they may be faced with a 50% penalty tax on retained earnings, Desrosiers said.

In response to the IRS ruling, Adapso has asked Rep. Ed Zschau (R-Calif.) to introduce legislation retroactive to 1963 that would exclude computer software licensing and maintenance fees from the personal holding company income category, Desrosiers said.

Adapso also hopes to convince the IRS that a mechanical application of the personal holding company tax would impede the development of the nation's software industry.

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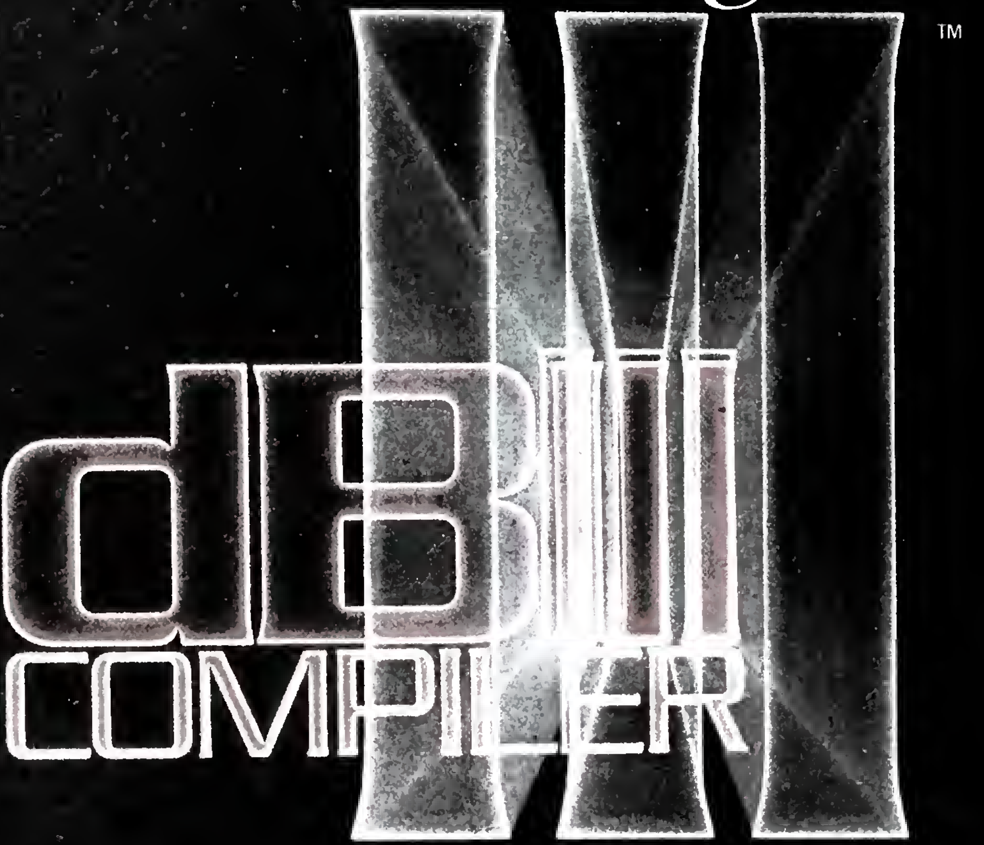

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Cray revenue triples for quarter

MINNEAPOLIS — The sale of nine supercomputer systems in the first quarter allowed Cray Research, Inc. to report $118.6 million in revenue, nearly triple the $44.1 million posted in the first quarter of 1984.

Profits for the quarter ended March 31 were $30.8 million, or $2.05 per share, up from $5.7 million, or 39 cents per share, one year ago. In the first quarter of 1984, Cray sold two systems and leased three others.

Because of the multimillion-dollar price tags of its key products, Cray's quarterly results are influenced significantly by the number of computer systems accepted during the period and by whether systems are purchased or leased.

Cray Research Chairman John A. Rollwagen said the company expects to install 30 new systems in 1985. "Though all of the systems accepted in the first quarter were purchased, we still anticipate significant leasing activity during the balance of the year, involving approximately half of the remaining systems," Rollwagen said.

CURB

from page 85

board thing, like a 10% or 20% surcharge on all Japanese products, we'll get caught in it."

Like most of its competitors, National Semiconductor has been hard hit by stockpiled customer semiconductor inventories, plummeting chip prices and the overall high-tech slowdown. "This is the worst downturn any of us in the industry can remember and the first one not tied to a general economic slump," Sprague said.

But he predicted National Semiconductor will rebound within three to four months with a boost from its 32-bit microprocessor-based products. "The Series 32000 is our brightest ray of hope in a while," Sprague said. "We think we have leadership in the technology, that [Intel Corp.] is way late and [Motorola, Inc.] is later than the market thinks. That's the best way out of a slump — to build proprietary products and hang others on them."

Pickup in market

Sprague believes the overall semiconductor industry recovery will coincide with a pickup in the computer and electronics market later this year. "Obviously we won't pick up in a vacuum, but eventually, our customers are going to chew through their inventories," he said. "The business hasn't gone away; it's simply an inventory problem. I know one company that bought $30 million worth of 64K chips at $5 each. Recently, I've heard of the same things selling for 65 cents."

Sprague also based his optimism on automobiles and other products currently in the design stage that will require more microprocessor-based technology than previous models.

NAS' recently unveiled AS/XL mainframe series is targeted directly at the IBM 3090 series Sierra, and Sprague had harsh criticism for Big Blue's market promises on another product, the discontinued PCjr microcomputer.

PCjr only 1% of IBM sales

"You guys in the press were lied to, everyone was lied to," Sprague said. "If any other company was touting a product like that right before pulling the plug on it, the [Securities and Exchange Commission] would be all over them. But IBM got away with it because the PCjr amounted to less than 1% of [its] business.

"IBM depends on what I call the 'FUD factor' — fear, uncertainty and doubt," he continued. "It's a big enough elephant to keep the marketplace in chaos when it wants to."

Sprague downplayed AT&T's recent entry into the 32-bit microprocessor sweepstakes and its intent to purchase four Honeywell, Inc. Synertek chip factories. "Being a monopoly for so long doesn't train you for competition," he said. "And I challenge anyone to name a more competitive business than semiconductors. If they don't succeed, it's no big deal to their overall business, but if we don't figure out the semiconductor market, we're dead. And the threat of death helps keep people focused."

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Compaq posts 42% profit rise

HOUSTON — Compaq Computer Corp. recently announced that its first-quarter profits rose 42% to $4.6 million, or 17 cents per share, compared with $3.3 million or 12 cents per share, one year ago.

The most successful maker of IBM-compatible desktop microcomputers reported revenue of $97 million for the quarter ended March 31, up 54% from $62.9 million in the year-earlier quarter.

"Our first-quarter results are especially gratifying when compared with the mixed results of other personal computer companies during this period," Compaq President and Chief Executive Officer Rod Canion said.

Canion said sales of the company's four Deskpro personal computer models increased steadily each month during the quarter. The company claimed that the Deskpro is now the second-best-selling line of desktop business micros, trailing the IBM Personal Computer line.

Personal computers debut

The company also recently introduced the Telecompaq series of personal computers. The series is said to combine telecommunications capabilities in a desktop micro.

The Telecompaq is a product of the company's Dallas-based Compaq Telecommunications Corp. subsidiary.

Compaq recently completed construction on the first of its three-building Compaq Center, its new corporate headquarters in northwest Houston.

DG

from page 85

and service from a single vendor is greater than ever before."

De Castro called the reported decline in the personal computer market a myth and expressed confidence that sales of the coolly received Data General/One would pick up. "The complaints about the [Data General/One's] LCD screen are behind us," he said. "Overall, our personal computer business has held up well, and desktop model sales are up 50% this year."

Last week, DG announced across-the-board price cuts on the Data General/One. The price for the most commonly sold configuration was slashed by $600, or 15%, to $3,495.

De Castro predicted DG would require 30% to 35% growth in 1986 to post a 12% or 13% profit margin next year. He said achieving such growth depends largely on the overall economy, even though the company has high hopes for the products it plans to announce in the next six months. "If people aren't buying anything, products won't make a difference," he said.

De Castro included on the Data General/One user list Colorado Gov. Richard Lamm, Lotus Development Corp. Chairman Mitchell Kapor and Apple Computer, Inc. co-founder Steven Wozniak.

TAKEOVER

from page 85

interests of the shareholders."

Ray Hannon, executive assistant to the president at Sterling, said confidential discussions have been ongoing for several weeks between officers of the two companies and that Sterling is hopeful the talks will continue.

According to Hannon, Sterling does not foresee any problems with a loss of managerial goodwill at Informatics if the takeover is successful because, he said, "even a fallout of Informatics' executives would not diminish the long-term benefits we'd gain from Informatics' products and markets. The business will remain viable."

Informatics posted a 1984 revenue of $191 million and profits of $6.2 million. Last week, Informatics reported that first-quarter profits were $68,000, or 1 cent per share, down from year-earlier profits of $689,000, or 12 cents per share; revenue increased to $49.9 million from $41 million a year earlier. Sterling in 1984 posted a revenue of $18.7 million with profits of $1.1 million.

Curt A. Monash, a vice-president at Paine Webber, Inc. who observes software companies, said Informatics is ripe for a takeover because of its decentralized operations, unpopular management team and cash-rich position. According to Monash, Informatics is a $200 million company with approximately $50 million in cash assets and a $75 million debt. Sterling's offer of more than $130 million actually reflects a real-cash bid of $80 million for the company, which Monash called attractive.

During a recent meeting of software and services companies, John Cullinane, chairman and CEO of Cullinet Software, Inc., said of the Informatics battle, "I can't believe this is happening in the software industry; it's a first." Cullinane said he did not think the takeover attempt, if successful, would add any technical or business value to Informatics.

Informatics last Monday responded to the takeover threat with a lawsuit seeking to block Sterling from proceeding with the proxy battle, acquiring additional Informatics stock or from voting the shares it already holds. Informatics alleged that Wyly offered Bauer personal inducements, including guaranteed employment for 10 years, in exchange for Bauer endorsing the takeover attempt. Informatics also claimed Sterling's proxy battle was based on confidential information provided by Informatics during negotiations.

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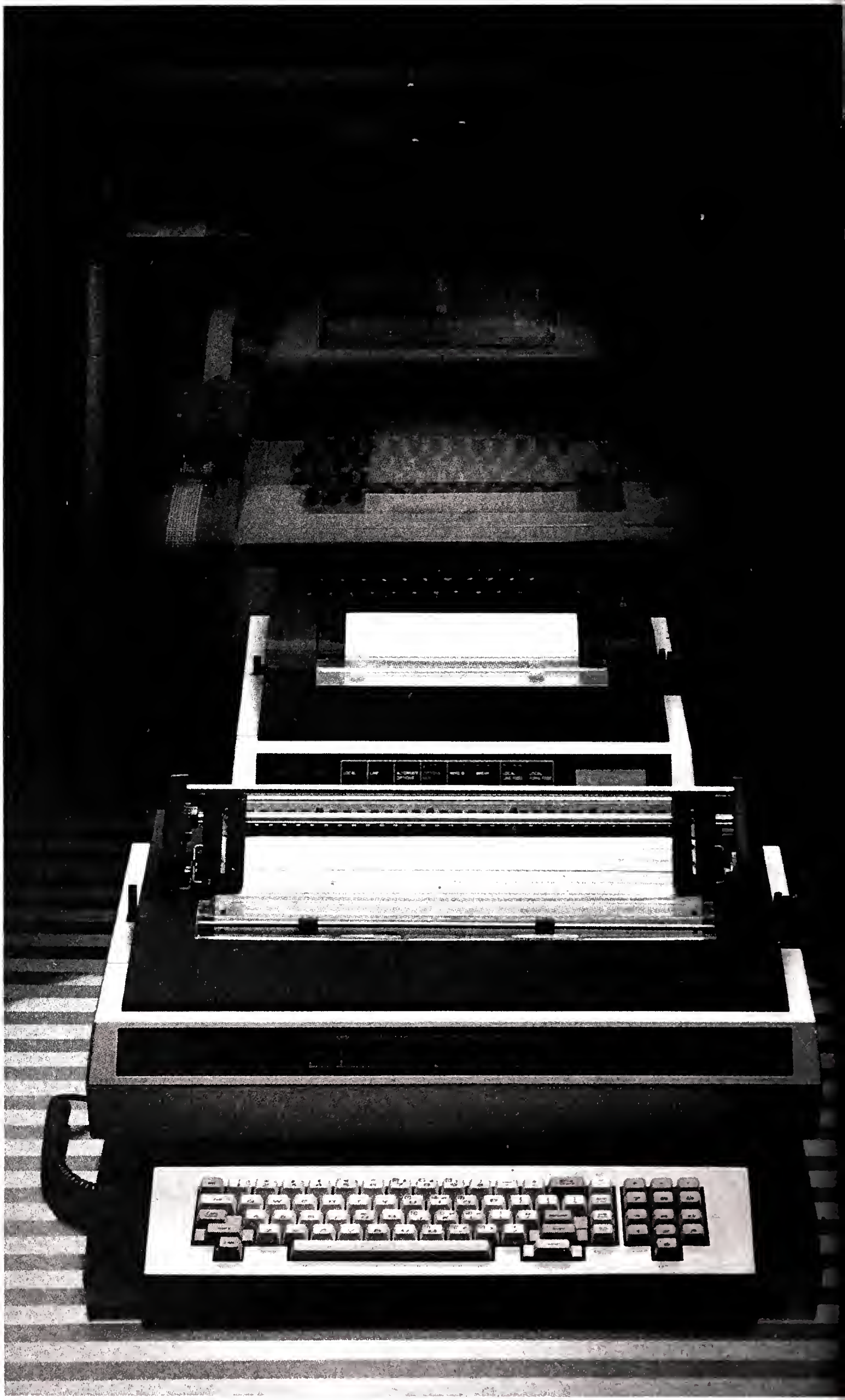

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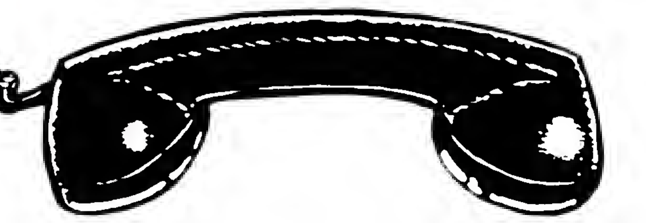

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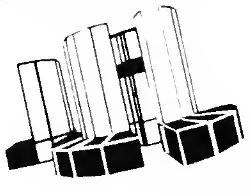

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Reports to the Director of the Program in Computing, Applied Mathematics and Technology and is responsible for assisting faculty members in various academic disciplines in using the computer in their courses. Assists with the selection, design and/or development of software packages and the appropriate integration of the computer into academic courses.

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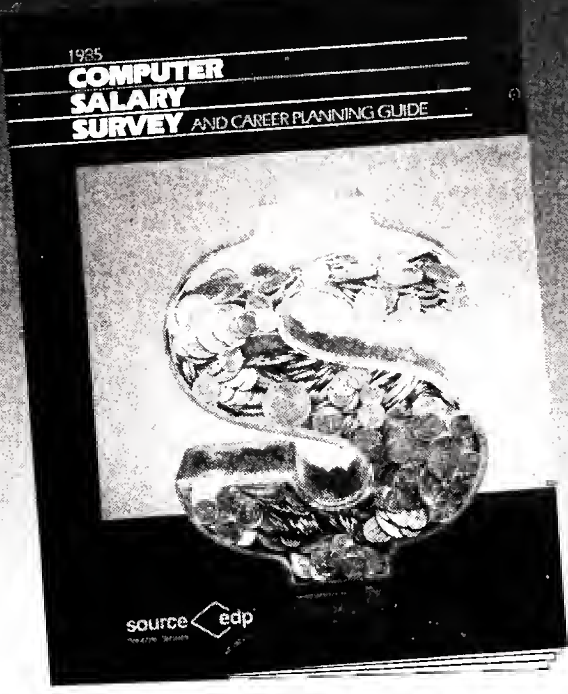

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Will direct the planning, cost justifying, implementation and operations of the computer equipment supporting the scientific/engineering user base for the Research Center. Will also supervise the planning and implementation of voice and data communication systems. Previous communications and VAX computer experience is required. A BS in Computer Science is required and an MS is desired, along with 8-10 years of applicable work experience

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Provides planning, analysis and support in our data communications environment, makes hardware and software evaluations and recommendations for our voice and data communication systems. 3-5 years of applicable work experience, and a BS in electrical engineering or computer science is required

OFFICE AUTOMATION SPECIALIST

Plans, justifies, implements, and supports necessary hardware and software to provide word processing and other office automation technologies at the Research Center. A BS in computer science or a related field, along with 2-3 years of applicable work experience is required. A broad exposure to office automation packages is desired

Salary and benefits are excellent, as is the potential for career advancement. For confidential consideration, please send resume and salary history to James R. Craft, Employment Coordinator, Babcock & Wilcox, Alliance Research Center, 1562 Beeson Street, Alliance, OH 44601.

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MANAGER OF DATA PROCESSING

A construction industry trade association which offers contractor members professional assistance in labor relations, government affairs, research, and standards development, has an opening for an individual to manage the existing computer systems and activities, to work with present users, and to participate in the development of a replacement system scheduled within 1 year.

The current configuration is a micro data Reality-Royale series B. A replacement system which will support at least 16 users is planned for installation this fall.

Salary commensurate with experience. Send resume and salary history to Search, P.O. Box 70, Merrifield, Virginia 22116. EOE.

PROGRAMMING ANALYST, SENIOR

Supervise programming of IBM System 38 computer. Responsible for job scheduling, technical support, programmer training project management and supervising systems analyst. BA or BS and 4 years experience as Senior Programming Analyst or 1 year experience as systems analyst with IBM systems 38 required. 5 days, 40 hours per week, $40,000 per year. DOT 020.162.014. Report to NYS Job Service, 2 West Avenue, Hicksville, NY. JO# 0603082.

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Our mailing address is **COMPUTERWORLD, Classified Advertising, 375 Cochituate Road, Box 880, Framingham, MA 01701.** Or call for more information at 1-800-343-6474 or, in Massachusetts, (617)879-0700.

X.25 Network Consultant

Temporary Assignment in Norway

Electronic Data Systems (EDS) Corporation is one of the nation's fastest growing information processing companies, with clients across the U.S. and around the world. Due to our recent expansion, we have an immediate need for an X.25 Network Engineer to take on a two-year assignment in Norway.

Your duties will involve supervising the design and development of an X.25 network which will interface with IBM SNA. In replacing existing DECNET/MICOM/UNIVAC networks, the system will encompass 1,000+ terminals now and is expected to grow 100% per year.

The expert we seek must have experience in X.25 network planning, installation and operations, including interface of IBM and DEC VAX equipment. Hands-on experience as a network operator and data communications troubleshooter/technician is also mandatory. Other desirable background includes training and experience in IBM SNA software and various types of network planning and operations procedures.

EDS can offer you a dynamic environment for career advancement and limitless career opportunities due to our recent alliance with General Motors. We also offer exceptional salary and company-paid benefits packages. If you are interested in adding international experience to your background and want unlimited career potential, call or send your resume immediately to:

Mark D. Valachovic
Electronic Data Systems Corporation
Corporate Headquarters Recruiting
12200 Park Central Drive
Suite 200, Dept. 1CW1265B
Dallas, TX 75251
(214) 392-8619

EDS

Electronic Data Systems Corporation
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Yemen Arab Republic Technical Assistance Project General Notice

The International Development Association (IDA) has approved a development credit equivalent about US $4.7 million for a technical assistance Project to the Central Planning Organization.

The project includes two year of services each for a Senior Adviser/Computer specialist, Technical Advisers/Computer Systems Analysts (2), Cost specialist, Contract specialist and Technical Assistance specialist.

The Project also includes overseas staff training in information resource management and systems development, project cost estimating and control, procurement documentation and practices, management of technical assistance and development planning and follow-up.

Interested agencies and individual applicants for the specialists posts, may obtain further information by writing to the Project Director, Technical Assistance Project, Central Planning Organization, P,.O. Box 175, Sana'a Yemen Arab Republic; notifications of interest must be received not later than **May 31, 1985.** Applicants should indicate their specific areas of interest.

DL1 DATA BASE ANALYST

Outstanding WESTERN NY foods processor has immediate need for DL1 Data Base Analyst. Will have total D.B. respon. Req. min. 2 yrs.' exp. w/DL1 & solid bkgrd. in DOS/VSE & CICS environ. COBOL & TOTAL knowl. desirable. Pleasing rural setting w/low cost of living. To $31,000.

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Personnel Agency

DIRECTOR
OF INSTRUCTIONAL ENGINEERING & MAINTENANCE

SEARCH EXTENDED - DIRECTOR: The State Unversity of NY College at Plattsburgh seeks a Director of Instructional Engineering and Maintenance. The Director supervises engineering and maintenance of all instructional media and electronic equipment. Included are - TV systems and equipment, academic computing systems and hardware, audio visual, and scientific equipment. BA Degree (preferably EE) preferred. Background and experience desired include: Experience as Assistant or CE of TV station or equivalent, maintenance of media and electronic equipment, budget planning, management, and supervisory capabilities. Send resume and three letters of recommendation to: Dr. Ann Hasting, Assistant Academic Vice President, c/o Ms. Mayerlyn Miller, Director of Personnel/Affirmative Action, Kehoe Administration Building, Box 758, SUNY Plattsburgh, Plattsburgh, NY 12901. Search will remain open until qualified candidate is found. An Equal Opportunity/Affirmative Action Employer.

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SOLID STATE SYSTEMS, INC., located near Atlanta, Georgia is a successful 11 year-old corporation involved in the development and manufacture of computerized telephone systems and energy management systems. The 150 plus people at Solid State take great pride in past accomplishments and look eagerly toward the future.

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- Small company, open atmosphere.
- Leading edge technology exposure.

FOR FURTHER INFORMATION concerning opportunities at Solid State Systems, Inc. please direct your resume, including current salary, in strictest confidence to: **Marie Morgan, Solid State Systems, Inc., 1990 Delk Industrial Blvd., Marietta, Georgia 30067. U.S. Citizenship required, An Equal Opportunity Employer.**

INTERNATIONAL D.P. ADVISERS SAUDI ARABIA

The U.S. Bureau of the Census has been providing data processing technical assistance in the developing world for more than 35 years. Currently there is a need on its overseas staff for:

SENIOR SYSTEMS ANALYSTS AND PROGRAMMER ANALYSTS

Selected applicants will be assigned to the **CENSUS BUREAU'S** team working at the National Computer Center (NCC) in Riyadh, Saudi Arabia. The NCC is equipped with state-of-the-art equipment including an IBM 3081 (16x16) system running under CICS/TSO/MVS/SP. Staff responsibilities include the design, development, programming, and documentation for a variety of applications. User interface and training are important aspects of the work.

Minimum qualifications include U.S. citizenship, at least 5 years data processing experience, with at least a year on IBM 30XX systems. Arabic language capability a plus.

Assignments are for 24 months in Riyadh with R&R travel provided. Salary range is $30K-50K plus 20% differential, 5% Sunday premium pay, and cost of living allowance. Other benefits include free furnished housing and automobile, use of PX and commissary, and education allowances for children.

Please send Standard Form 171 (Personal Qualifications Statement) or resume to:

U.S. Department of Commerce
Bureau of the Census
Personnel Division, Room 3245-A
Washington, D.C. 20233
Attention: E. Archey

or call Martin J. McMahon
(301) 763-2868
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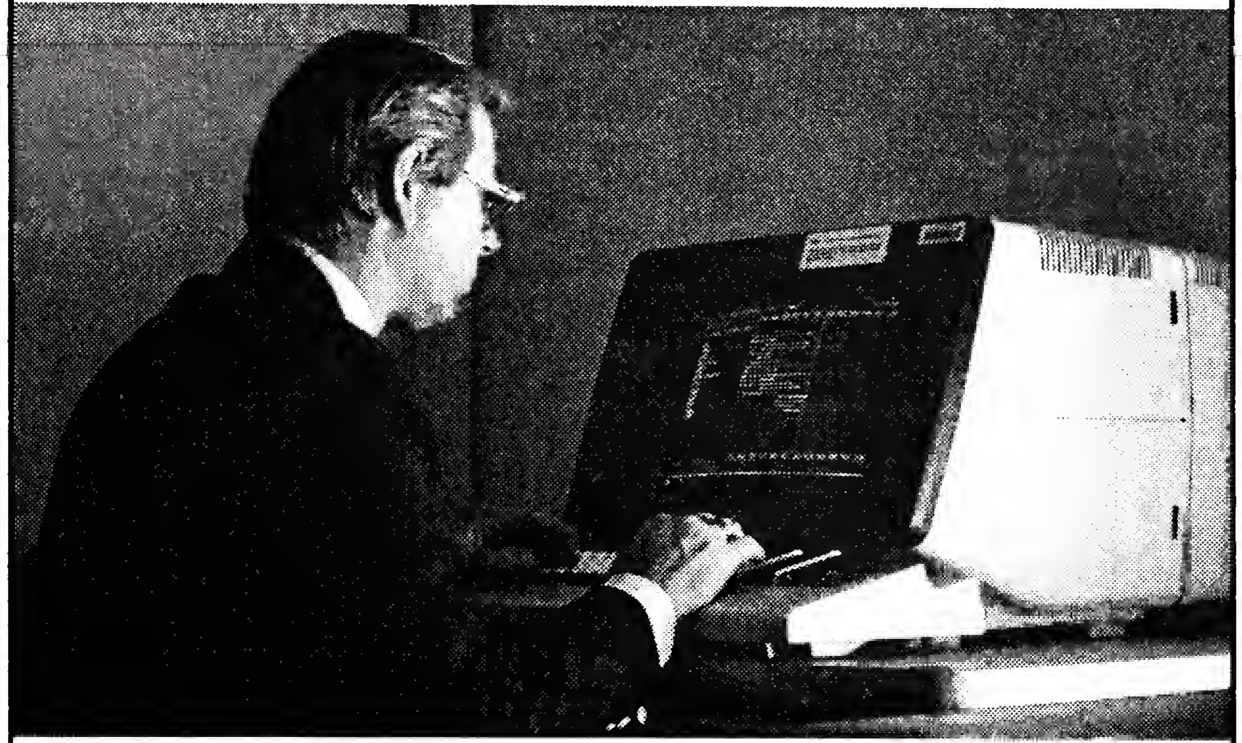

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Please send your resume to: Dave Coffey

■ Sr. Business System Programmers/Analysts ■ Operations Specialists ■ Operations/Data Control Analysts ■ Data Entry Analysts ■ Computer Operations Shift Supervisors

Please send your resume to: Mary Adams

Relocation assistance is available.

The involvement, scope and dimension of these career pursuits are further heightened through some of the most tangible, comprehensive personal benefit arrangements available. Please send your resume to the appropriate contact person at: **Computer Systems Employment Office, Dept. CW 627, P.O. Box 1138, Pico Rivera, CA 90660-9977.**

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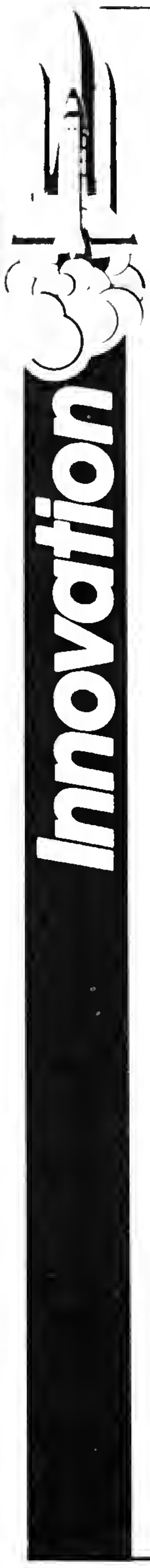

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Don't be a spectator. Join Lockheed Space Operations Company as they prepare for the first of many shuttle launches from the West Coast. It will all happen from Vandenberg AFB, on the beautiful central California coast. As prime contractor, Lockheed is involved in the preparation, launch, landing and turnaround activities of the entire shuttle fleet. This requires talented individuals.

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You will analyze and support data-based applications, management information systems and related functions. GCOS, COBOL, IDS, GMAP, DMIV and other related experience for a Honeywell DPS8/70 host system is required.

These are ground floor opportunities that will put you right in the middle of America's most exciting space program. The experience you bring will be enhanced by the resources and benefits of a well established Fortune 100 company. For consideration, send your resume to Lockheed Space Operations Company, Employment Office, Dept. CW56, 1100 W. Laurel Ave., Suite C, Lompoc, California 93436. Lockheed is an equal opportunity, affirmative action employer. U.S. citizenship is required.

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Requires a minimum of 3 years data processing experience and some background with application, security and general control reviews. An accounting or computer science degree is preferred. You will work independently, and some travel is involved.

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Requires 3 - 5 years financial systems experience and a degree in accounting. A CPA or CIA is a plus. Minimum travel is required.

If you are motivated by quality performance and tremendous career potential, you could share in EDS' success. We offer competitive salaries, an outstanding company-paid benefits package and a professional, stable environment. Please send your resume in confidence to:

Joe Barnes
Electronic Data Systems Corporation
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12200 Park Central Dr.
Suite 200, Dept. 1CW1265A
Dallas, TX 75251

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MANAGER OF ADMINISTRATIVE DATA PROCESSING

West Virginia Network for educational telecomputing has an immediate opening for a Manager of administrative data processing to manage existing data base systems, recommend, design, develop and implement common network-wide administrative systems and assist in the training of new applications programmers Requirements B S degree plus 6 years experience in programming, analysis or equivalent, 1 year experience in data base management systems, 1 year experience with CICS application programming (preferred) thorough knowledge of system procedures and techniques and demonstrated proficiency in two higher level languages Salary: high 30 s apply by May 30, 1985 to Ricki Dulin, Personnel Manager, WVNET, 837 Chestnut Ridge Rd Morgantown, WV 26505 EOE

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You should have 5–10 years experience in telecommunications networking, including both voice and data. Strong project management abilities and proven managerial skills are essential. A BS degree is required; an advanced business degree would be helpful. Candidates must possess excellent oral and written communications skills.

We offer an outstanding salary, relocation and benefits package designed to attract and retain top professional talent. Interested and qualified candidates are invited to send resumes with salary requirements to: Bank of America, BASE Human Resource Management, Dept. 3228-CW56, P.O. Box 37000, San Francisco, CA 94137. An equal opportunity employer.

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Outstanding career opportunities and challenging assignments.
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Send your resume, with salary history and requirements to:
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Send resume and salary history to:

Art Brown
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City of Charlotte
600 East Trade Street
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TECHNICAL MANAGEMENT

Computer Facility Director

Responsible for maintenance and operation of hardware and software for the Stanford Graduate School of Business computer facilities consisting of three DEC mainframes, over 300 terminals, and 200 personal computers. You will supervise applications development and support activities and perform planning and budgeting to serve the research, teaching, and administrative information processing needs of students, staff, and faculty.

You must have strong analytical, management, and communication skills. Knowledge of business administration topics and business related applications software on mainframes and microcomputers is required. Other qualifications include management experience in information technology and a demonstrated working knowledge of DEC System 20 and VAX mainframe/minicomputer hardware; IBM, HP, Apple, and DEC microcomputers; and TOPS 20, VAX/VMS, UNIX*, and MS-DOS operating systems. MBA and knowledge of IBM mainframe hardware and software are desired.

Assistant Director of Operations

Qualifications are similar to the director, but with strong operations expertise.

Assistant Director of Applications

Qualifications are similar to the director, but with strong applications development expertise.

Please send resume and cover letter to Vernetta Wilson, Req 32783 CW, Personnel Dept., Old Pavilion, Stanford, CA 94305. Equal Opportunity Employer Through Affirmative Action.

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Stanford University

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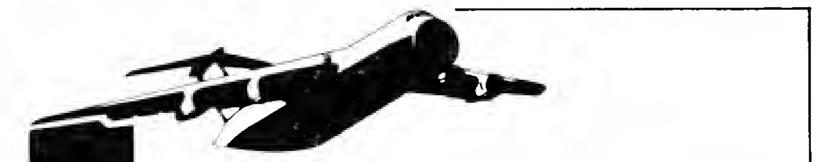

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(SOFTWARE QUALITY ASSURANCE)

Lockheed-Georgia currently has immediate career opportunities for qualified engineers in the following job categories:

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Will develop SQA systems and interfaces related to modern production control and manufacturing process control systems. Requires BSME, I&SE plus 5 years' experience in manufacturing systems software design, development and analysis.

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Responsible for development of SQA system and interfaces related to mission critical embedded software and firmware within aerospace products. Requires BSEE, Comp. E or CS plus 2 years' experience in software design related to embedded products and microcircuits. EARPROM, EPROM and PROM design, development and testing desirable.

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Responsible for development of SQA system and interfaces related to Management Information Systems, large data base systems design/development, data communication networks and I.S. software quality tools, techniques and methods. Requires BSCS, Comp. E or Information Systems plus 2 years' software design related to large M.I.S.

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SYSTEMS ANALYST

The Roman L Hruska U.S Meat Animal Research Center invites applications for the position of Systems Analyst. This is a University of Nebraska position. The position is responsible for installation and maintenance of system software and represents the Center with hardware maintenance contractors. A new super-mini computer system is proposed for the Center. Training on the new system will be provided. B.S in Computer Science or related area and 3 years of quality experience required. Some knowledge of agriculture desired. Salary range $24,000 - $26,400. Send resume, transcripts, and list of 3 professional references to: Mr. Terry Madson, Personnel-/Business Officer, U.S. Meat Animal Research Center, Box 166, Clay Center, Nebraska 68933. Application deadline May 29, 1985. The University is an AA/EEO employer.

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To help make computer-aided design system by: analyzing system; designing and implementing computer program; developing menus and icons; developing input language and data requirements and format for input; and helping in the writing of english-language instructional manuals. Requires MS in Computer Science or Information Systems plus substantial knowledge of engineering or industrial psychology. Carlsbad jobsite near San Diego. $26,000 per year. If offered employment, must show you have the legal right to work. Send this ad and your resume to Job #1740, P.O. Box 865, Sacramento, CA 95804 not later than May 21, 1985.

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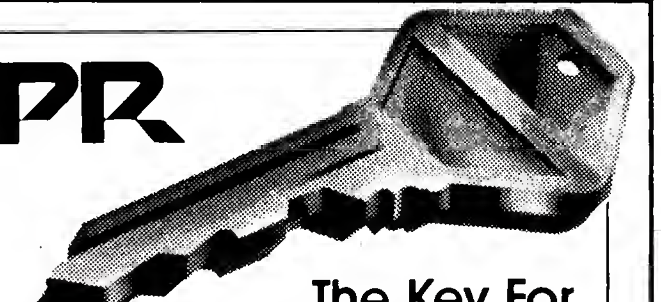

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AA/EOE

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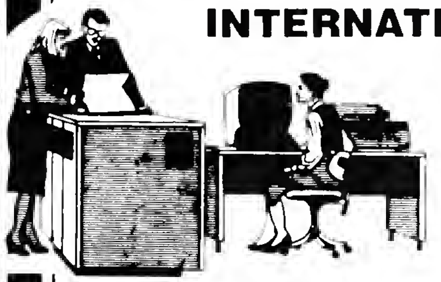

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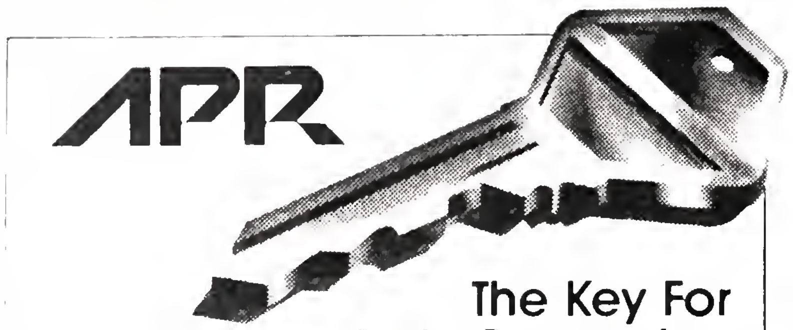

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DIRECTOR OF CAMPUS COMPUTING

The University of Missouri-Columbia (UMC) has embarked on an ambitious plan for academic computing which includes new central equipment, widespread installation of microcomputers, distributed processing and a campus network. UMC is served by a four-campus network which operates an IBM 3081, an Amdahl V8 and an Amdahl V7; and also operates an IBM 3031 on campus. Plans are underway to upgrade the 3031 facility to a state of the art facility with sufficient capacity for the major portion of the campus's academic computing.

With more than 23,000 students and 1,600 faculty, the University of Missouri-Columbia is the largest campus in the University of Missouri four-campus system. UMC is a land-grant university with a broad base of programs in the liberal arts, sciences, and professional areas, and a strong commitment to graduate education and research. With over 250 degree programs UMC is one of only five institutions offering on a single campus accredited programs in agriculture, business, education, engineering, journalism, law, medicine and veterinary medicine.

RESPONSIBILITIES

The Director reports to the Vice Chancellor, Administrative Services and has primary responsibility at the policy level for the planning and delivery of the information, computing and digital communications systems and services which support the diverse instructional, research, extension, and administrative activities of the University of Missouri-Columbia. The Director and Vice Chancellor receive policy and planning guidance from a committee, chaired by the Provost, consisting of representative faculty and deans.

QUALIFICATIONS

Candidates must have the demonstrated ability to provide leadership and coordination in an academic environment and the ability to communicate and work effectively with diverse groups of faculty, students and administrators. A doctoral degree and experience in computing in an academic environment is required. The salary will be commensurate with experience and qualifications. The position will be filled at the earliest mutually agreeable time.

APPLICATIONS

The closing date for nominations and applications is May 22, 1985. Applicants should submit a letter of application, a current vita, and the names and addresses of at least three references to: Dr. Duane Stucky, Vice Chancellor, Administrative Services, University of Missouri-Columbia, Personnel Services, 1205 University Ave., Suite 600, Columbia, MO 65211, AA/EOE

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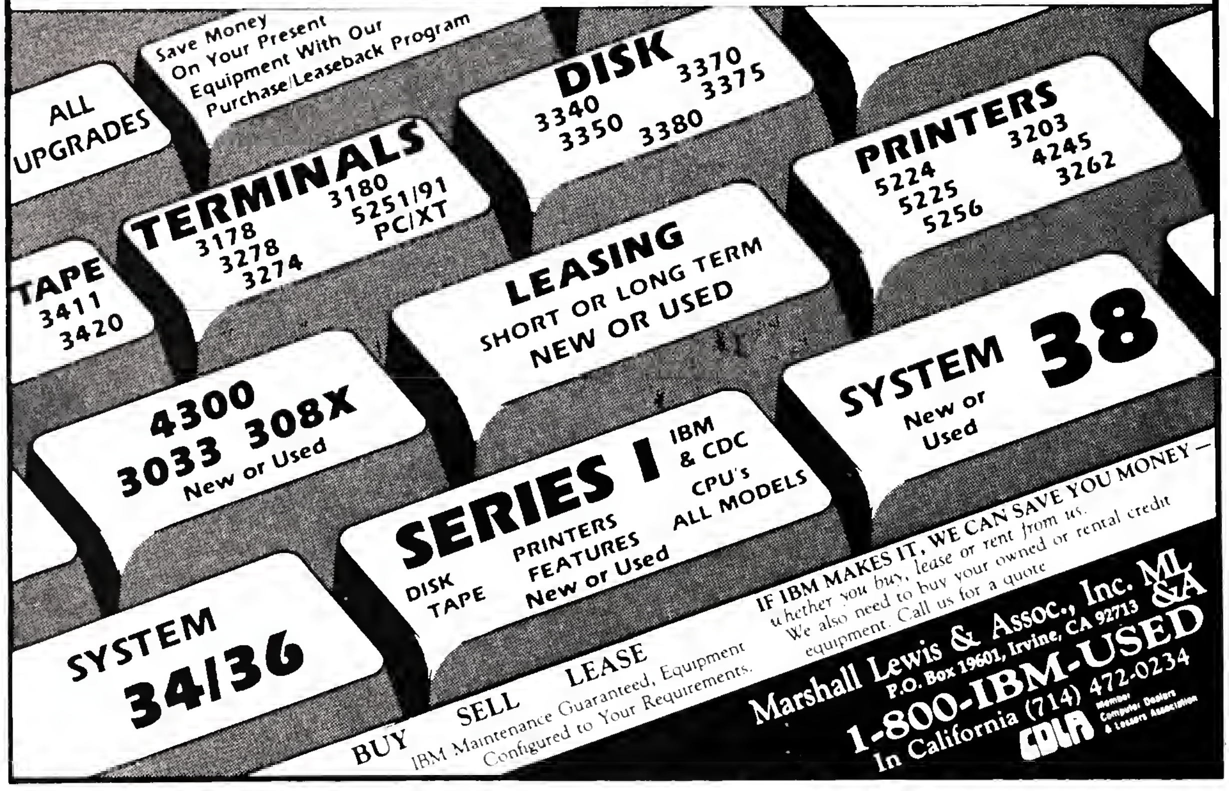
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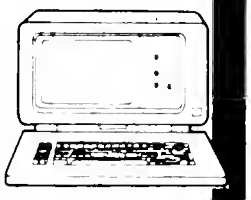
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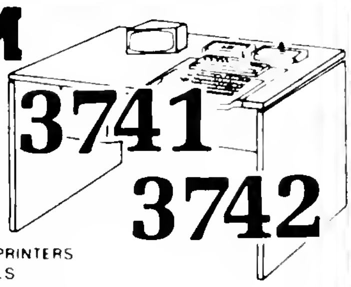

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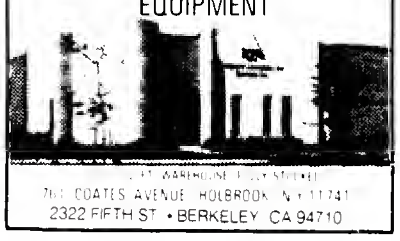

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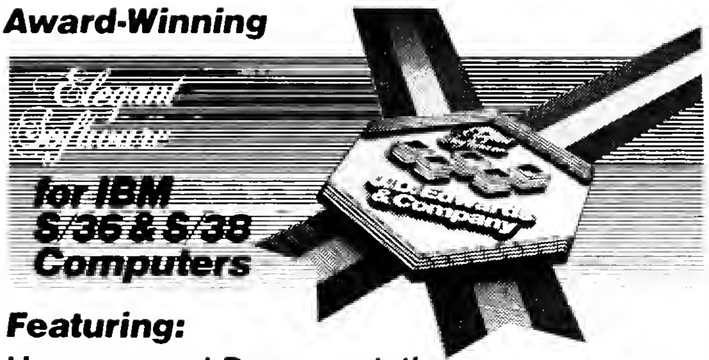

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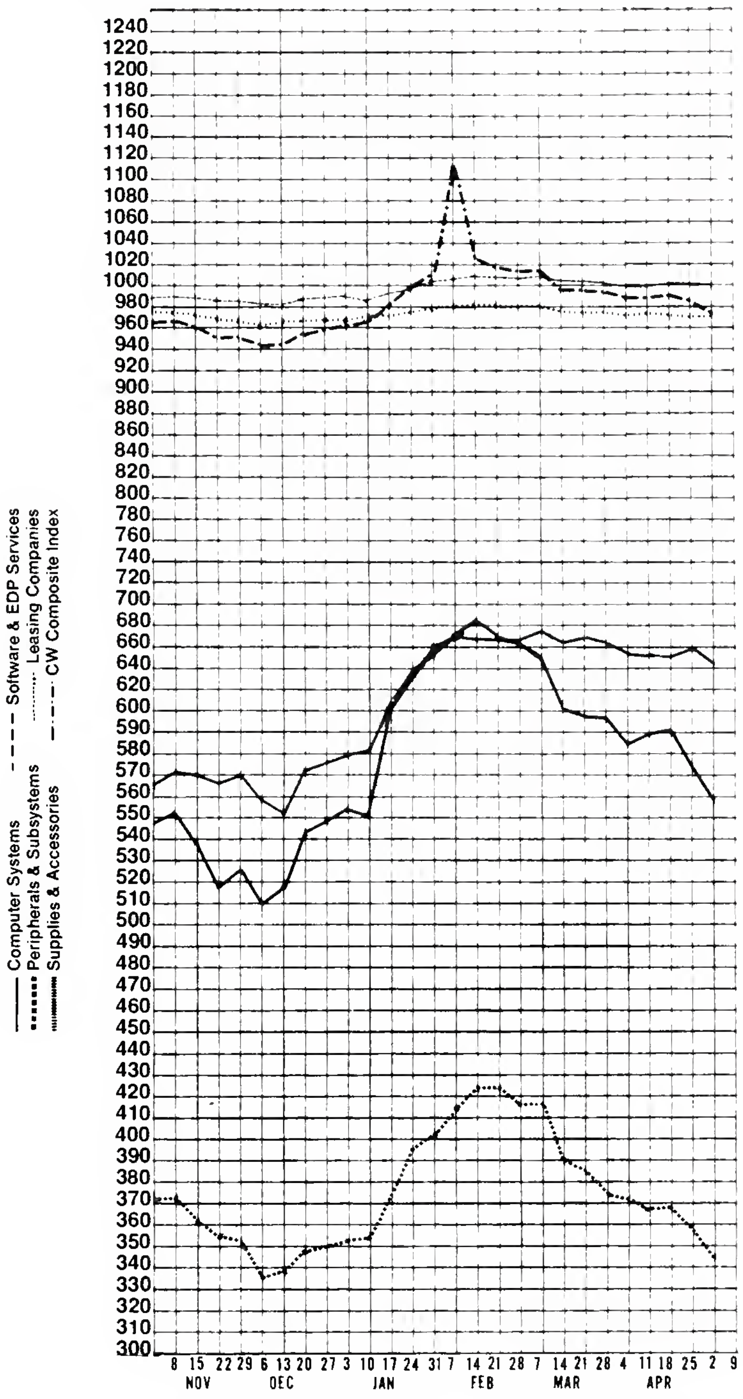

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COMPUTER SYSTEMS

EXCH		1985 RANGE (1)	CLOSE MAY 1 1985	WEEK NET CHNGE	WEEK PCT CHNGE
O	ALPHA MICROSYSTEMS	6- 24	7	- 1/4	-3.4
O	ALTOS COMPUTER SYST	7- 21	10 3/8	- 3/4	-6.7
O	AMDAHL CORP	10- 19	12 1/2	-1	-7.4
O	APPLE COMPUTER INC	18- 63	20 7/8	-1 1/8	-5.1
N	AT&T	15- 22	20 5/8	- 7/8	-4.0
N	BURROUGHS CORP	46- 64	56 5/8	-2 5/8	-4.2
O	COMPAQ COMPUTER CP	4- 15	5	0	0.0
O	COMPUTER AUTOMATION	[illegible]- 7	7 3/8	+ 5/8	+9.2
O	COMPUTER CONSOLES	7- 20	7 3/8	0	0.0
N	CONTROL DATA CORP	25- 38	29 7/8	- 3/4	-2.4
O	CONVERGENT TECHNOL	5- 41	7 3/4	+ 1/8	+1.6
N	CRAY RESEARCH INC	39- 79	67 3/4	-4 7/8	-6.7
O	DAISY SYSTEMS CORP	14- 36	26	-2	-7.1
N	DATA GENERAL CORP/	38- 74	38	- 3/4	-1.9
N	DATAPOINT CORP	12- 26	14 1/2	+ 3/4	+5.4
N	DIGITAL EQUIPMENT	77-125	96 3/8	-5	-4.8
A	EECO INC	12- 16	14 5/8	+ 3/8	+2.6
N	ELECTRONIC ASSOC.	3- 7	4 3/8	- 3/8	-7.8
N	FLOATING POINT SYST	12- 31	24 3/4	- 5/8	-2.4
N	[illegible]	26- 36	27 1/2	-1 1/2	-5.1
O	GENERAL AUTOMATION	5- 16	5 1/2	0	0.0
N	GOULD INC	20- 32	20 5/8	-1 1/4	-5.7
N	HARRIS CORP	23- 35	25 1/8	- 1/8	-0.4
N	HEWLETT-PACKARD CO	21- 44	31 3/4	-2 1/4	-6.6
N	HONEYWELL INC	46- 68	55 1/8	-2	-3.5
N	IBM	99-137	125 5/8	-3	-2.3
O	IPL SYSTEMS INC	1- 14	2	0	0.0
N	ITT CORP	21- 42	33 3/4	- 1/8	-0.3
N	M/A-COM INC	13- 24	17 3/4	-1 3/8	-7.1
N	MANAGEMENT ASSIST	3- 29	2 5/8	- 1/4	-8.6
N	MATSUSHITA ELEC(ADR)	52- 81	58 5/8	- 1/2	-0.8
N	MODULAR COMPUTER SYS	6- 10	6 1/2	- 1/8	-1.8
N	MOHAWK DATA SCI	4- 17	3 1/2	- 3/8	-9.6
N	MOTOROLA INC	29- 44	28 7/8	-1 7/8	-5.9
N	NAT'L SEMICONDUCTOR	10- 17	10 3/8	- 3/8	-3.4
N	NBI INC	13- 24	14	0	0.0
N	NCR	21- 31	26	-1 1/4	-4.5
N	PERKIN-ELMER	18- 30	23	+ 1/4	+1.0
N	PRIME COMPUTER INC	11- 20	16 1/8	- 3/8	-2.2
N	SPERRY CORP	35- 54	49 1/8	-2 1/8	-4.1
O	STRATUS COMPUTER INC	9- 17	14 1/4	0	0.0
O	TANDEM COMPUTERS INC	15- 40	19 1/4	+ 3/4	+4.0
N	TANDY CORP	24- 37	29 1/2	-1 1/4	-4.0
O	TELEVIDEO SYSTEMS	[illegible]- 41	2 7/8	- 1/8	-4.1
O	TELXON CORP	8- 20	18 3/4	- 3/4	-3.8
N	TEXAS INSTRUMENTS	93-150	93	- 3/8	-0.4
A	ULTIMATE CORP	10- 24	12 3/8	-1 1/2	-10.8
O	VECTOR GRAPHICS INC	0- 5	3/4	+	+8.3
A	WANG LABS "B"	17- 32	17	0	0.0
A	WANG LABS "C"	17- 32	16 7/8	- 1/8	-0.7
N	XEROX CORP	35- 47	45 1/8	-1 3/4	-3.7

LEASING COMPANIES

EXCH		1985 RANGE (1)	CLOSE MAY 1 1985	WEEK NET CHNGE	WEEK PCT CHNGE
O	BOOTHE FINANCIAL CP	10- 22	17 5/8	-1 1/8	-6.0
A	CMI CORP	4- 10	8 7/8	+ 1/2	+5.9
N	COMDISCO INC	8- 17	14 1/8	- 7/8	-5.8
O	CONTINENTAL INFO SYS	5- 16	7 3/4	0	0.0
N	DPF INC	10- 17	16 1/8	+ 5/8	+4.0
O	FINALCO GROUP INC	4- 12	4 1/8	+ 1/8	+3.1
O	PHOENIX AMERICAN INC	2- 17	2 5/8	+ 1/4	+10.5
O	[illegible] INC	8- 21	9 3/8	+ 1/8	+1.3
N	U.S. LEASING	[illegible]- 44	35 1/2	-2 1/2	-6.5

COMPONENTS

EXCH		1985 RANGE (1)	CLOSE MAY 1 1985	WEEK NET CHNGE	WEEK PCT CHNGE
N	ADVANCED MICRO DEV	25- 41	26 7/8	-2 1/4	-7.7
O	[illegible] SEMICONDUCTOR	11- 26	11 1/4	- 3/4	-6.2
N	ANALOG DEVICES INC	16- 25	18 1/4	-1 5/8	-8.1
O	ANALOGIC CORP	10- 21	14	+1	+7.6
N	APPLIED MAGNETICS CP	9- 20	13	0	0.0
O	HADCO CORP	4- 12	4 1/2	+ 1/8	+2.8
O	MICRO MASK INC	7- 19	6 7/8	-1 3/8	-16.6
N	TERADYNE	20- 35	20 1/8	-3	-12.9

EXCH: N=NEW YORK; A=AMERICAN; P=PACIFIC; B=BOSTON;
L=NATIONAL; M=MIDWEST; O=OVER-THE-COUNTER
O T C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST BID
(1) TO NEAREST DOLLAR

SOFTWARE & EDP SERVICES

EXCH		1985 RANGE (1)	CLOSE MAY 1 1985	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED COMP TECH	2- 4	2 3/4	+ 1/8	+4.7
A	ADVANCED SYSTEMS INC	9- 22	9 1/2	0	0.0
O	AGS COMPUTERS INC	10- 22	[illegible] 3/4	+ 3/8	+2.6
O	AMERICAN SOFTWARE	4- 20	[illegible] 3/4	- 1/4	-2.0
N	ANACOMP INC	2- 5	3 5/8	- 1/4	-6.4
O	ANALYSTS INTL CORP	5- [illegible]	9 1/2	+ 1/2	+5.5
A	APPLIED DATA RES	6- 16	[illegible]	- 3/4	-3.2
O	ASHTON-TATE	6- 15	7 7/8	-1	-11.2
O	ASK COMPUTER SYSTEMS	12- 24	14 1/2	-1	-6.4
P	ASTRADYNE COMP IND	1- 7	2 3/4	+ 1/2	+22.2
N	AUTOMATIC DATA PROC	[illegible]- 46	42	- 3/4	-1.7
O	COMPUTER ASSOC INT'L	[illegible]	24 3/4	-1	-3.8
O	COMPUTER HORIZONS	6- 20	7 5/8	- 1/4	-3.1
O	COMPUTER NETWORK	5- 11	7 1/2	0	0.0
N	COMPUTER SCIENCES	11- 17	14 7/8	+ 1/4	+1.7
O	COMPUTER TASK GROUP	12- [illegible]	[illegible] 1/4	+1 1/4	+5.6
O	COMPUTER USAGE	[illegible]- 18	3/4	0	0.0
O	COMPUTONE SYSTEMS	4- 22	7 5/8	- 3/4	-6.5
O	COMSERV CORP	1- 16	3	0	0.0
O	COMSHARE	6- 14	9 1/4	- 5/8	-6.3
O	CULLINET SOFTWARE	[illegible]	25 1/2	-1 3/8	-5.1
O	CYCARE SYSTEMS INC	8- 27	22	- 1/2	-2.2
O	HOGAN SYSTEM INC	5- 27	5 1/8	- 1/8	-2.3
N	GENERAL ELECTRIC CO	48- 65	58 1/4	-2 3/8	-3.9
N	GEN MOTORS ("EDS")	[illegible]- 72	67 7/8	-2 5/8	-3.5
N	GTE CORP	36- 45	40 1/8	- 1/2	-1.2
O	INFORMATICS GENERAL	14- 27	26 1/2	+2 1/2	+10.4
O	INFORMATION SCIENCE	2- 17	2 1/4	+ 1/4	+12.5
O	INFOTRON SYSTEMS CP	15- 37	21	- 3/4	-3.4
O	KEANE ASSOCIATES	[illegible]	19	+4 1/4	+28.8
N	LOGICON	18- 34	31 1/8	-2 1/4	-6.7
O	LOTUS DEVELOPMENT CP	15- 40	27	-1 3/4	-6.0
O	MCI COMMUNICATIONS	6- 26	6 5/8	- [illegible]	-4.1
O	MGMT SCI AMER INC	9- 33	12 7/8	- 1/8	-0.9
O	MATHEMATICAL APP GRP	6- 16	5 1/2	0	0.0
O	MICOM SYSTEMS INC	22- 50	21 3/4	-3	-12.1
O	MICROPRO INT'L CP	[illegible]- 10	2 5/8	0	0.0
O	NATIONAL DATA CORP	8- 26	11 3/8	- 1/8	-1.0
O	[illegible] SOFTWARE INT	4- 29	7	+ 1/4	+3.7
O	PANSOPHIC SYSTEMS	[illegible]- 30	19 7/8	- 1/4	-1.2
O	[illegible] RESEARCH	10- 15	11 5/8	- 1/2	-4.1
O	POLICY MGMT SYSTS CP	22- 25	26	- 3/4	-2.8
O	PROGRAMMING & SYS	4- 6	5 1/4	0	0.0
O	REYNOLDS & REYNOLD	28- 53	38 1/4	-1 1/2	-3.7
O	[illegible] CORP	[illegible]- 34	17 1/4	-1	-5.4
O	SHARED MEDICAL SYST	27- 47	29 3/4	-1 1/4	-4.1
O	SCIENTIFIC COMPUTERS	5- 14	6 1/4	- 3/8	-5.6
O	SOFTWARE AG	9- 21	13 5/8	- 1/2	-3.5
O	[illegible]	10- 14	11 3/8	- 1/4	-2.1
O	[illegible]	7- 17	14	+ 1/4	+1.8

PERIPHERALS & SUBSYSTEMS

EXCH		1985 RANGE (1)	CLOSE MAY 1 1985	WEEK NET CHNGE	WEEK PCT CHNGE
O	AM INTERNATIONAL	2- 7	4	0	0.0
O	ANDERSON JACOBSON	3- 11	3	+ 3/8	+14.2
O	AST RESEARCH INC	[illegible]- 20	16 1/2	-2 3/4	-14.5
O	AUTO-TROL TECHNOLOGY	7- 29	7	- 1/2	-6.6
O	AVANT-GARDE COMPUTING	11- 29	10 3/4	-1 1/2	-12.2
O	[illegible] INC	5- 27	8	-2 1/4	-21.9
A	BEEHIVE INT'L	1- 7	5/8	- 1/8	-16.6
N	BOLT BERANEK & NEWN	17- 30	25 7/8	- 5/8	-2.3
O	CAMBEX CORP	1- 3	1 5/8	- 1/8	-7.1
O	CENTRONICS DATA COMP	2- 14	3 1/8	- 5/8	-16.6
A	CETEC CORP	7- 12	6 5/8	- 1/8	-1.8
A	COGNITRONICS	4- 9	4 3/8	- 1/2	-10.2

EXCH		1985 RANGE (1)	CLOSE MAY 1 1985	WEEK NET CHNGE	WEEK PCT CHNGE
N	COMPUGRAPHIC CORP	[illegible]	[illegible]	- [illegible]	-5.4
O	COMPUTER TRANS[illegible]	[illegible]	[illegible]	+	+7.[illegible]
N	COMPUTERVISION CORP	18- 40	[illegible]	[illegible]	-7.[illegible]
N	CONRAC CORP	[illegible]	[illegible]	- [illegible]	-[illegible].9
O	DATAPRODUCTS CORP	[illegible]	[illegible]	- [illegible]	-4.[illegible]
O	DATARAM CORP	4- [illegible]	[illegible]	+ [illegible]	+2.6
O	DATA SWITCH CORP	[illegible]	[illegible]	- 3/8	-8.5
O	DATUM INC	5- [illegible]	5 3/4	- [illegible]	-4.[illegible]
O	DECISION DATA COMPUT	[illegible]	[illegible]	-	-7.[illegible]
O	DOCUTEL-OLIVETTI	3- 35	5 1/4	+ [illegible]	+2.4
N	ELECTRONIC [illegible]	[illegible]	[illegible]	-1	-11.4
O	ENDATA INC	4- 16	3 [illegible]	-1 1/8	-22.5
O	EVANS & SUTHERLAND	[illegible] 50	[illegible] 1/4	- 3/4	-5.[illegible]
O	GANDALF TECHNOLOGIES	[illegible]	6 [illegible]	- 1/2	-7.4
N	GEN DATACOMM IND	[illegible]	14	+ 5/8	+4.6
N	HAZELTINE CORP	23- 33	24 3/4	-1 1/2	-5.7
O	[illegible] CORP	3- 8	5 3/8	+ 7/8	+19.4
O	INFORMATION INTL INC	[illegible]	[illegible]	- 1/4	-[illegible]
O	INTECOM INC	5- 21	5 3/8	- 1/4	-4.4
O	INTEL CORP	25- 45	26 3/4	- 5/8	-2.2
A	[illegible] ELECTRONICS	[illegible]	[illegible]	+ [illegible]	+[illegible]
O	MEGADATA CORP	3- 6	5 3/4	0	[illegible]
O	MSI DATA CORP	8- 19	[illegible]	- [illegible]	-3.2
N	[illegible] CORP	[illegible]- 29	[illegible]	[illegible]	[illegible]
O	NETWORK SYSTEMS CORP	16- [illegible]	[illegible]	[illegible]	-5.[illegible]
N	NO AMERICAN PHILIPS	[illegible]- 45	[illegible] 1/2	- 5/8	-[illegible]
N	NORTHERN TELECOM LTD	[illegible]- 42	[illegible]	[illegible]	-[illegible]
O	[illegible]	[illegible]- 6	[illegible]	0	0.0
A	PARADYNE CORP	11- 18	11 3/4	-1 3/8	-10.4
A	[illegible] CORP	9- 14	12 3/8	0	0.0
N	PLESSEY CO (ADR)	20- 35	22 3/4	-1 1/4	-5.2
O	PRINTRONIX INC	[illegible]	11 [illegible]	- 1/2	-4.0
O	QMS INC	8- 17	10 7/8	- 3/4	-6.4
O	RAMTEK CORP	4- 23	4 1/4	- 3/8	-8.[illegible]
N	RECOGNITION EQUIP	[illegible]	11 5/8	- 3/4	-6.0
N	SANDERS ASSOCIATES	[illegible]	[illegible] 5/8	-4 3/8	-11.8
O	[illegible] CORP	9- 19	12	- 3/8	-3.0
N	SCIENTIFIC ATLANTA	8- 14	11 1/4	- 1/2	-4.2
O	SEAGATE TECHNOLOGY	4- 20	6 5/8	+ 1/2	+8.[illegible]
N	STORAGE TECHNOLOGY	2- [illegible]	2 [illegible]	- 3/8	-12.[illegible]
O	SYKES DATATRONICS	[illegible]	5/8	- 1/16	-8.[illegible]
A	T BAR INC	7- 11	7	- 3/4	-9.6
A	TAB PRODUCTS CO	[illegible]- 20	[illegible]	0	[illegible]
O	TANDON CORP	5- 35	5 [illegible]	- [illegible]	-[illegible].5
A	TEC INC	8- 13	[illegible]	- 5/8	-5.[illegible]
N	TEKTRONIX INC	[illegible]	[illegible]	[illegible]	-[illegible]
N	TELEX	[illegible]	39 5/8	[illegible]	-[illegible].8
O	[illegible]	[illegible]	[illegible]	+ [illegible]	+25.[illegible]
N	[illegible]	[illegible]	[illegible]	- [illegible]	-[illegible].9
O	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

SUPPLIES & ACCESSORIES

EXCH		1985 RANGE (1)	CLOSE MAY 1 1985	WEEK NET CHNGE	WEEK PCT CHNGE
N	[illegible]	[illegible]	[illegible]	[illegible]	-[illegible]
N	[illegible]	[illegible]- 33	[illegible]	[illegible]	-5.2
N	[illegible]	[illegible]	[illegible]	- [illegible]	-[illegible]
N	ENNIS BUS. FORMS	[illegible]	[illegible]	[illegible]	-[illegible]
N	[illegible] COMPANY	65- 68	[illegible]	- 3/4	-5.[illegible]
N	MOORE CORP LTD	[illegible]	[illegible]	+ [illegible]	+[illegible]
O	STANDARD REGISTER	[illegible]	[illegible] 1/2	-	[illegible]
N	WALLACE COMP SERVICE	[illegible]	[illegible]	[illegible]	[illegible]

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